CATEGORY 1

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STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529
STN-50-530 Palo Verde Nuclear Station, Unit 3, Arizona Publi 05000530
AUTH.NAME AUTHOR AFFILIATION
SEAMAN,C. Arizona Public Service Co. (formerly Arizona Nuclear Power
RECIP.NAME RECIPIENT AFFILIATION
Records Management Branch (Document Control Desk)

SUBJECT: Forwards revised EPIPs,which are being sent IAW 10CFR50,App E.V.EPIPs included with transmittal indicated on encl list. Effective date of EPIPs is 990915.

DISTRIBUTION CODE: A045D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 3+1600
TITLE: OR Submittal: Emergency Preparedness Plans, Implement'g Procedures, C

NOTES:STANDARDIZED PLANT 05000528
Standardized plant. 05000529
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Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

094-01298-CKS/tas
September 21, 1999

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Emergency Plan Implementing Procedure Update

Enclosed are copies of revised PVNGS Emergency Plan Implementing Procedures (EPIPs), which are being sent in accordance with 10 CFR 50, Appendix E.V. The EPIPs included with this transmittal are indicated on the enclosed list. The effective date of these EPIPs is September 15,1999.

APS is forwarding two copies of the enclosure to the NRC Region IV Office, and a copy of the revised EPIPs have been provided to the NRC Resident Inspector's Office as an update to the assigned controlled procedures. These procedures supersede all former PVNGS Emergency Plan Implementing Procedures.

If you have any questions, please contact me at (602) 393-2099.

Sincerely,

Craig Seaman
Director
Emergency Services

CKS/tas

Enclosure

cc: E. W. Merschoff (w/Enclosure - 2 copies)
P. H. Harrell (w/o Enclosure)
N. Kalyanam (w/o Enclosure)
J. H. Moorman (w/o Enclosure)

9909280427 990921
PDR ADOCK 05000528
F PDR

ENCLOSURE

REVISED EMERGENCY PLAN IMPLEMENTING PROCEDURE LISTING

REVISED PVNGS EMERGENCY PLAN IMPLEMENTING PROCEDURES

Satellite Technical Support Center Actions	EPIP-01 Rev. 3
Operations Support Center Actions	EPIP-02 Rev. 16
Technical Support Center Actions	EPIP-03 Rev. 22
Emergency Operations Facility Actions	EPIP-04 Rev. 22
Backup Emergency Operations Facility Actions	EPIP-05 Rev. 10
Reassembly Area Operations	EPIP-06 Rev. 10
Telecommunications	EPIP-07 Rev. 3
Emergency Planning Administration	EPIP-08 Rev. 2

EP NO.	CURRENT REVISON	PAGE (S) NUMBERS MARKED*
EPIP-01	3	7, 10, 13, 16, 17, 23, 46, 110, 113, 138, 167, 170, 172, 175, 439
EPIP-02	16	13, 31, 95, 98, 123, 152, 155, 157, 160, 424
EPIP-03	22	31, 50, 114, 117, 142, 171, 174, 176, 179, 443 46, 110, 113, 138, 167, 170, 172, 175, 439
EPIP-04	22	44, 108, 111, 136, 165, 168, 170, 173, 437
EPIP-05	10	9
EPIP-06	10	None
EPIP-07	3	3, 7, 8 through 18
EPIP-08	2	40, 41, 43, 44, 63, 84

***Certain EPIPs contain information considered private or proprietary (including names, home telephone numbers, and internal and external telephone numbers, which must remain available during an emergency). In accordance with Generic Letter No. 81-27, the specific information has been bracketed on the indicated pages. We request this information be considered confidential and withheld from public disclosure pursuant to 10 CFR 2.790(a) and 10 CFR 9.17(a).**

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP10	**03**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks
SBY EPIP-08

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For Questions Contact NIRM
x6131 m.s. 7720

9909280430 990921

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP11	**09**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION P1-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks
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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP12	**02**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks
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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP13	**02**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION P1-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks

SBY EPIP-01,EPIP-02,EPIP-03,EPIP-04

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Nuclear Information and Records Management Transmittal

Procedure Number 16DP-0EP14

Revision # 07

Effective Date 09-15-99

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks
SBY EPIP-01

Quantity to be Reproduced	
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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP15	011	09-15-99

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks
SBY EPIP-03

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP16	**005**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks

SBY EPIP-02

Quantity to be Reproduced	
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For Questions Contact NIRM

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP17	**009**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks
SBY EPIP-04

Quantity to be Reproduced	
PW 12	ST

For Questions Contact NIRM

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
16DP-0EP18	02	09-15-99

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
16DP-0EP		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION P1-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
16DP-0EP		00-000	CROZIER,D	X/STA-6050	PW	1	
16DP-0EP		00-000	DUNCAN,R	X/STA-6050	PW	1	
16DP-0EP		00-000	WOLFE,W	X/STA-6050	PW	1	
16DP-0EP		00-000	LINES,H	X/STA-7003	PW	1	
16DP-0EP		00-000	SMITH,D	X/STA-7294	PW	1	
16DP-0EP		00-000	IDE,W	X/STA-7605	PW	1	
16DP-0EP		00-000	SONTAG, M	X/STA-7997	PW	1	
16DP-0EP		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
16DP-0EP		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	

Remarks

SBY EPIP-01,02,03,04

Quantity to be Reproduced	
PW 12	ST

For Questions Contact NIRM

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-01	**003**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIP-07		17-027I	RADIOLOGICAL ASSESSMENT COMMUNICATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027J	PLANT STATUS TECHNICIAN	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027K	SECURITY COORDINATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027M	GOVERNMENT LIASON	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Q	EMERGENCY OPERATIONS DIRECTOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027R	DOSE ASSESSMENT HEALTH PHYSICIST	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Y	SHIFT TECHNICAL ADVISOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-08		05-015	SUPV-STDS	H/DAWPS-BLDG	PW	1	
EPIP-08		17-027	DISTRICT-MANAGER	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-01	**003**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	
EPIPS		05-025		B/UII-CR	PW	1	
EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 15	ST

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-01	**003**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE.B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
EPIPS		15-002	CAS	D/SEC-BLDG	PW	1	
EPIPS		15-003	SAS	D/SEC	PW	1	
EPIPS		17-001		C/ANX-DW-EOF-LIB	PW	1	
EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 14	ST

For Questions Contact NIRM

x6131 m.s. 7720

PROCEDURE INTENT

This procedure provides functional instruction for the activation and operation of the Satellite Technical Support Center

rev description

3 This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16DP-0EP13	Emergency Classification
16DP-0EP14	Satellite Technical Support Center Actions
16TD-0EP012	Assembly
16TD-0EP031	Core Damage Assessment
16TD-0EP041	Dose Projection
16TD-0EP051	Emergency Exposures and KI
16TD-0EP054	Emergency Response Data System
16TD-0EP056	ERFDADS Application
16TD-0EP161	Protective Actions
16TD-0EP191	Site Evacuation
Unnumbered	Dose Projection Basis Document
Unnumbered	Emergency Action Levels Basis Document

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1.0 OBJECTIVE

This procedure provides a means of classifying events into one of the four emergency classifications described in the PVNGS Emergency Plan. It should be referenced anytime the Shift manager / Emergency Coordinator has determined that the Unit or site is, or has the potential to be, in a degraded condition.

This procedure also provides functional instruction for the activation and operation of the Satellite Technical Support Center. It should be referenced anytime by Emergency Response personnel when responding to that facility during any classified emergency event.

2.0 EXPECTATIONS/RESPONSIBILITY FOR EMERGENCY PLAN IMPLEMENTATION

2.1 Personnel Indoctrination

2.1.1 The on-duty Shift Manager is the senior licensed member with the ultimate responsibility to protect the health and safety of the public. This Shift Manager responsibility is of the highest priority and supersedes all other responsibilities, including event mitigation. When an event occurs, the Shift Manager should remain in, or return to the Control Room and perform emergency plan reviews and classifications as required. Qualified personnel at the scene of the problem will assess any situation and relay information to the control room. The Shift Manager is responsible to ensure the initial classification and proper notifications are completed. The Site Manager should not relieve the Shift Manager of the Emergency Coordinator (EC) function until completion of the initial classification and notification. If the Site Manager is present at the onset of the event, it is acceptable for the Site Manager to make the initial classification and notification.

2.1.2 During emergency situations wherein the Shift Manager is physically (i.e. personnel injury) prevented from fulfilling emergency plan requirements, the Site Manager is responsible for assuming the Emergency Coordinator role and implement the emergency plan. In the interim period prior to the Site Manager arriving in the affected Control Room, the following hierarchy shall be followed:

2.1.2.1 **Plant Transient <u>not</u> in progress** - The Control Room Supervisor (CRS) is responsible for emergency plan implementation until relieved by the Shift Manager/Site Manager. The CRS is responsible to make the initial classification prior to being relieved as EC. If the Site Manager is present at the onset of the event, it is acceptable for the Site Manager to make the initial classification and notification.

2.1.2.2 **Plant transient in progress** - The CRS is responsible to assign an EC qualified individual to implement the emergency plan until relieved by Shift Manager/Site Manager. The assigned individual should be in order of preference: Unaffected Unit Shift Manager, Site Manager, other SRO, STA, or RO.

2.1.3 NUREG 0654 requires notification of State/Local officials and the NRC within 15 minutes and 1 hour respectively, following declaration of an emergency condition. Regulations do not specify a time limit for classifying an emergency. However, consistent with the NRC position published in Emergency Preparedness Position #2 dated 8/95, **it is PVNGS management's expectation that 15 minutes is also an appropriate limit for classification of an event once indications are available to the Control Room operators that an Emergency Action Level (EAL) has been exceeded.** Failure to recognize that an EAL has been met or exceeded does not delay commencement of the 15 minute classification time-clock. Classifications shall be made immediately following recognition that an EAL has been met or exceeded. It is not appropriate to wait 15 minutes to make a classification once an EAL has been met or exceeded.

2.1.4 For conditions wherein the unit momentarily enters and exits a higher emergency classification, the NRC, as well as State and Local officials **shall be notified of the transitory condition.**

3.0 LIMITATIONS AND PRECAUTIONS

3.1 For those situations involving more than one unit, the Unit 1 Shift Manager is responsible for initially classifying and declaring the emergency and assuming the position of Onshift Emergency Coordinator.

3.2 If the STSC becomes uninhabitable, the Emergency Coordinator should select an Unaffected Unit STSC as an alternate, with the assistance of the Radiation Protection Monitor.

3.3 In the event of a Security Contingency, such as a direct armed attack, the Emergency Coordinator should assign other personnel to perform the response actions which are normally performed by Security.

3.4 If an event could endanger arriving personnel due to safety or security conditions, the Emergency Coordinator should decide where emergency personnel should report and change the initial group pager and onsite Unit Evacuation System messages appropriately.

3.5 **Notifications to State/County agencies using the Palo Verde NAN Emergency Message Form shall commence within 15 minutes following each initial, upgraded, or downgraded emergency declaration or any change to a Protective Action Recommendation.** Notifications to State/County agencies per the Emergency Termination Message Form shall commence within 15 minutes following termination of the emergency declaration.

3.6 **The NRC shall be contacted immediately following notification of State/County agencies and within 60 minutes following initial, upgraded, or downgraded emergency declarations.** The NRC shall be contacted immediately following notification of State/County agencies for emergency declaration termination.

3.7 The NRC phone must be manned continuously at the NRC's request by a Senior Reactor Operator, Reactor Operator, or a Shift Technical Advisor.

3.8 **An Unaffected Unit Shift Technical Advisor shall report to the STSC and address core thermohydraulic and engineering parameters within 30 minutes after emergency event declaration** until relieved by the Reactor Analyst in the Technical Support Center.

3.9 **The Emergency Response Data System (ERDS)** shall be activated as soon as possible, but no later than 1 hour following a declaration of an **Alert** or higher emergency classification.

3.10 Assembly is recommended at the **Alert** classification unless the Emergency Coordinator is fairly certain that the condition will not deteriorate. Assembly and Accountability are mandatory for a **Site Area Emergency** or a **General Emergency.** Accountability of personnel within the Protected Area is accomplished within 30 minutes of an Accountability request, and continuously thereafter, using Protected Area boundary access control as described in the PVNGS Security Plan. Accountability is normally requested after Assembly has been completed.

3.11 Although **Site Evacuation is required at the General Emergency level**, it is an option for the Emergency Coordinator to determine the need for and order a site evacuation of non-essential personnel at a less severe classification level. The Emergency Coordinator may also direct sheltering or an early dismissal of personnel prior to a danger of radiation exposure.

3.12 A currently licensed Senior Reactor Operator must approve any suspension of safeguards directed by the Emergency Coordinator prior to taking the action.

3.13 For conditions wherein the unit momentarily enters and exits a higher emergency classification, the NRC, as well as State and Local officials **shall be notified of the transitory condition.**

3.14 Responsibilities of the Affected Unit Shift manager are:

- **initial classification of the event per this procedure within 15 minutes once indications are available to the Control Room operators that an EAL has been** exceeded
- notification of the Site Manager, the Shift Manager of an Unaffected Unit, or other qualified individual to assume the duty as Emergency Coordinator, when required
- organization of the onshift staff to place the plant into a safe condition
- assumption of the Emergency Coordinator position until relieved

3.15 The following **non-delegable duties** are assumed by the Emergency Coordinator upon classification of an emergency event:

- notification of offsite emergency response agencies and organizations
- provision of Protective Action Recommendations to offsite emergency management agencies
- subsequent reclassification of emergency events
- determination of the necessity for site evacuation
- authorization for emergency workers to exceed 10 CFR 20 exposure limits
- activation of onsite and offsite emergency response organizations for an Alert or higher emergency classification level

3.16 **The Radiation Protection Monitor shall deploy at least 1 offsite survey team within 30 minutes following emergency declaration of an Alert or higher classification** when an effluent monitor indicates a higher-than-normal release of radioactive materials is occurring. As appropriate, the team may be dispatched for surveys, advised to stand by, or secured from activities if no radiation release is apparent.

3.17 If ERFDADS is inoperable, meteorological information required by the Radiological Monitoring Technician can be obtained by dialing the national Weather Service (602-379-4609 or 602-379-4611).

4.0 ONSHIFT EMERGENCY COORDINATOR ACTIONS - EMERGENCY CLASSIFICATION

4.1 Emergency Classification

NOTE

NUREG 0654 requires notification of State/Local officials and the NRC within 15 minutes and 1 hour respectively, following declaration of an emergency condition. Regulations do not specify a time limit for classifying an emergency. **It is PVNGS management's expectation that 15 minutes is also an appropriate limit for classification of an event once indications are available to the Control Room operators that an Emergency Action Level (EAL) has been exceeded.**

Entry Conditions The following condition has been satisfied:

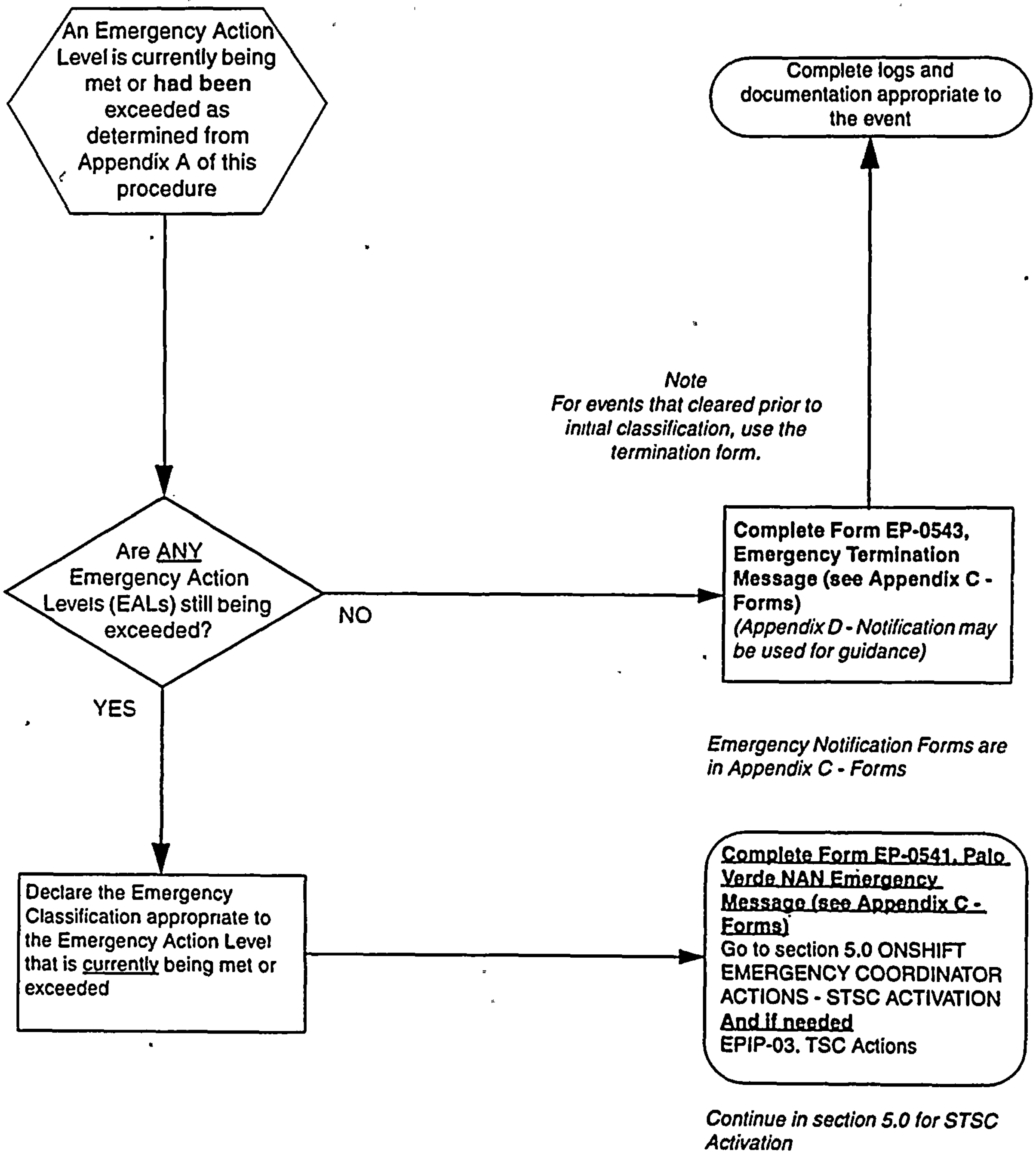
- A situation has occurred which requires (or may require) the implementation of the PVNGS Emergency Plan to protect the health and safety of the public.

Instructions

___ Evaluate the fission product barrier thesholds and the event based Emergency Action Levels in Appendix A - Emergency Action Levels for each emergency classification and determine the most accurate Emergency Action Level which is currently being met or exceeded.

___ Declare the emergency classification appropriate to the Emergency Action Level as determined by the flowchart on the following page.

4.2 Initial Actions flow chart



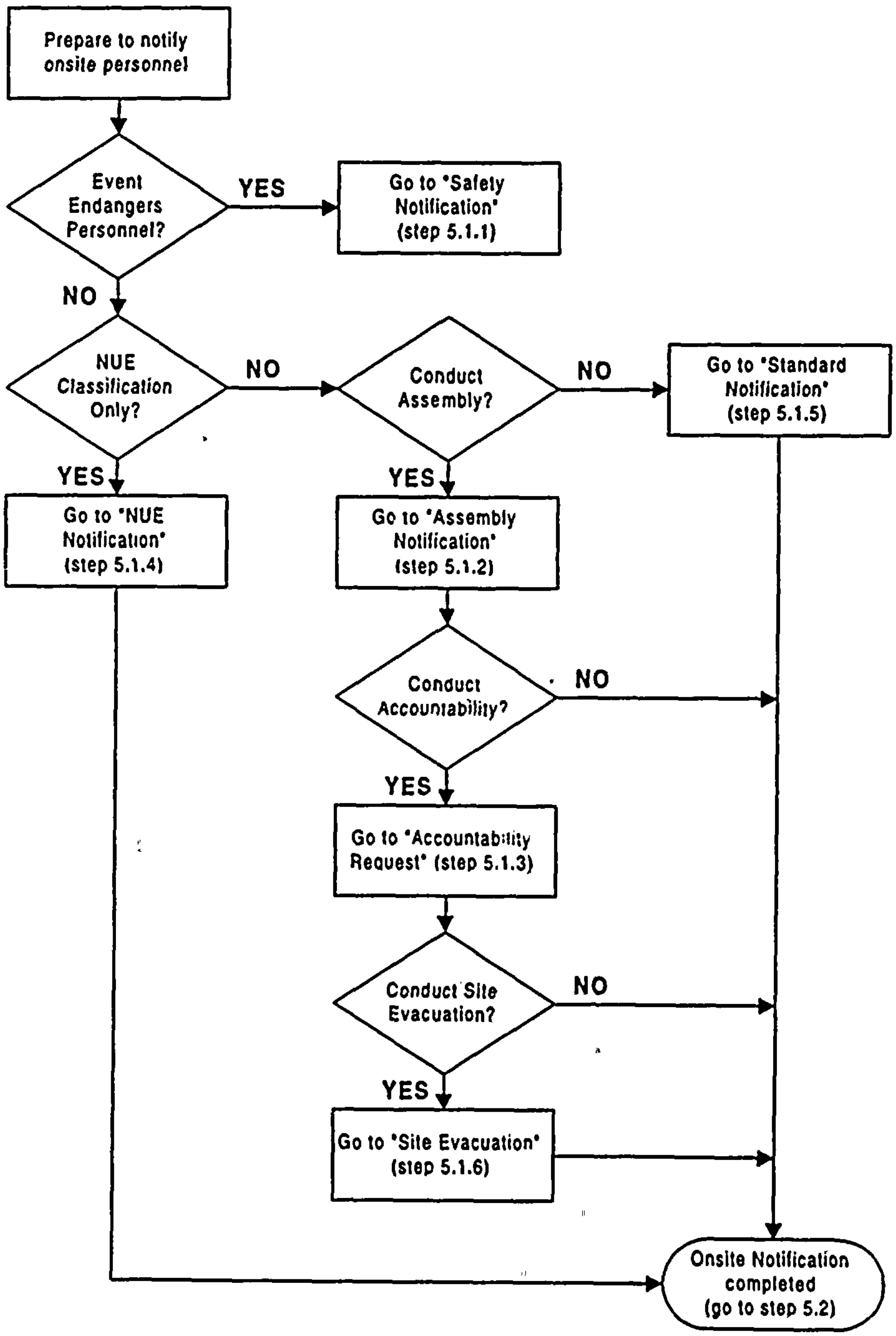
5.0 ONSHIFT EMERGENCY COORDINATOR ACTIONS - STSC ACTIVATION

5.1 Initial Actions - Onshift Emergency Coordinator

Facility Activation		Initial Actions - Onshift Emergency Coordinator
Security	___	**Contact CAS** via telephone (6470 / 6471 / 6472, 4444, or dedicated line) or radio, and direct the CAS operator to notify the Security Operations Section Leader to **complete supplemental notifications and activate the autodialer for Alert or higher.**
PARs	___	Determine the appropriate **Protective Action Recommendations** using Appendix B - Protective Action Recommendations and the RP Monitor's recommendations.
Notifications	___	Direct the Satellite Technical Support Center Communicator to complete and transmit the **Palo Verde NAN Emergency Message form to offsite agencies within 15 minutes of emergency event declaration** using Appendix D - Notification.
Site Manager	___	**Notify the Site Manager** of the emergency situation and direct the Site Manager to report to the Affected Unit Control Room and, upon arrival, conduct transfer of Emergency Coordinator responsibilities.
Activate STSC	___	**Activate the Satellite Technical Support Center** (STSC) when the following required personnel have reported to the STSC: • Radiation Protection Monitor • Satellite Technical Support Center Communicator • Shift Technical Advisor (STA) **Record the time:** __________
OSC	___	Activation of the STSC signals the activation of the required onshift Emergency Response Organization (ERO) staff. **Assemble the onshift ERO staff for an initial briefing in the general area of the STSC.** To facilitate subsequent briefings, **instruct the staff to function from the STSC area as much as possible.** Until activation of the OSC, TSC, and EOF, all ERO personnel are considered to be activated and functioning under the direction of the EC.

5.1 Initial Actions - Onshift Emergency Coordinator (continued)

Conduct onsite notifications using the following flow chart:



5.1 Initial Actions - Onshift Emergency Coordinator (continued)

5.1.1 Safety Notification

If the event could endanger personnel due to safety or security conditions, e.g., fire, toxic gas release, extreme weather conditions, security situation, etc., perform the following:

___ Transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. The following condition exists [*ONSITE* or *IN UNIT* ___] [*describe condition* ______________________]. All plant personnel are to take the following actions [*select all that apply]:*"

___ **"Take cover in the nearest safe location until further notice."**

___ **"Avoid the area of ___ [*describe area to avoid*]."**

(Repeat the message once.)

___ Return to the Onsite Notification Process Flowchart, if appropriate.

5.1.2 Assembly Notification

(Alert, Site Area Emergency, General Emergency)

___ If Assembly is to be conducted, perform the following:

- Sound the Unit Assembly Signal for approximately 30 seconds.
- Transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a ________________ exists in Unit ___ [if appropriate]. Assembly is required. All personnel report to your designated Assembly Area."

(Provide instructions on areas to avoid as appropriate. Repeat sounding the Unit Assembly Signal and the message once.)

___ Return to the Onsite Notification Process Flowchart, if appropriate.

5.1.3 Accountability Request

___ If Accountability is to be conducted after Assembly, perform the following:

- Request CAS Security personnel (verbally or via telephone) to perform Accountability and to provide the report within 30 minutes.

___ Return to the Onsite Notification Process Flowchart, if appropriate.

5.1 Initial Actions - Onshift Emergency Coordinator (continued)

5.1.4 NUE Notification

___ Transmit the following message over the Unit Evacuation System: **"Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a Notification of Unusual Event exists in Unit ___. All emergency response personnel stand by until further notice."**

___ Repeat message once. This responsibility can be delegated.

5.1.5 Standard Notification

(ALERT, Assembly not conducted)

___ For an Alert or greater where Assembly is not to be conducted, perform the following:
Transmit the following message over the Unit Evacuation System: **"Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a ________________ exists in Unit ___. All emergency response personnel report to your emergency location. All other personnel stand by until further notice."** Provide instructions on areas to avoid as appropriate.

___ Repeat message once. This responsibility can be delegated.

5.1.6 Site Evacuation

___ If Site Evacuation is to be conducted, determine the evacuation route / site egress point (with input from the Radiation Protection Monitor).

___ Instruct the Security Director to complete both the supplemental onsite notifications and the organization / security actions for a Site Evacuation. (6470 / 6471 / 6472, or 4444, or dedicated line or radio).

___ When actions to organize the evacuation have been completed and security measures have been established, transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. Site evacuation for non-essential personnel is required. Proceed to your own vehicles and follow the instructions from Security."

___ Sound the Site Evacuation Signal for approximately 30 seconds.

(Repeat the message once.)

5.2 Subsequent Actions - Onshift Emergency Coordinator

ERO Staff

___ Assume the following duties:

- Responsibility for **control of AO movement** under changing radiological conditions via the RPM interface.
- Responsibility for **formation, briefing, and dispatch of emergency response teams** via the RPM interface.
- Responsibility for **periodic briefing of onshift ERO staff** on current conditions.

Inplant and Protected Area repair team dispatch and control

Coordinate repetitive implementation of the following with the RPM - direct the available staff to prepare and dispatch inplant and Protected Area teams:

___ Keep advised on all personnel resource availability.

___ Prioritize team entries and dedicate resources per the following guidelines:

Primary:

- Immediate entry needed for life or equipment saving
- 10 CFR 20 exposure limits may be exceeded
- Appendix K - Emergency Exposures and KI may be used.
- Radiation Protection personnel will accompany the team.

Secondary:

- No life or equipment saving actions
- PVNGS Administrative Exposure Hold Points may be exceeded
- Appendix K - Emergency Exposures and KI may be used.
- A pre-entry survey will be completed

Normal:

- No life or equipment saving actions
- No dose limits exceeded

___ Work with the RPM as necessary to establish radiological controls, hold points, dose extensions and potassium iodide administration decisions.

5.2 Subsequent Actions - Onshift Emergency Coordinator (continued)

Followup

Perform the following actions as required:

IF...	THEN...
the **Shift Technical Advisor** time required actions need to be addressed	**Direct the Shift Technical Advisor(s) to assess core damage within 30 minutes, to notify the USNRC within 1 hour,** and to activate the Emergency Response Data System within 1 hour, if appropriate.
dose projection requirements need to be addressed	Direct the Radiation Protection Monitor to deploy at least 1 offsite survey team within 30 minutes and obtain the dose assessment data necessary to complete a dose projection.
the **other Units** need to be informed of the event	Notify the unaffected Units' Shift Managers of the emergency.

Status

Perform the following actions as required:

IF...	THEN...
reclassification of the emergency is required	Reclassify per Appendix A - Emergency Action Levels.
you need a **plant status** update from Control Room personnel	Review the initiating event, plant status, emergency classification, EOP in use, and corrective actions with Control Room personnel.
a **briefing to onshift ERO** staff is indicated	Conduct briefings based on plant conditions and other problems.
emergency teams need to be dispatched	During onshift staff timeframes, the RPM will assist in team briefing and dispatch. After TSC activation, the TSC will control teams.
additional information to the **Arizona Radiation Regulatory Agency** is necessary	Direct the Satellite Technical Support Center Communicator to prepare form EP-0542, Follow-up Emergency Message (see Appendix C - Forms).

5.2 Subsequent Actions - Onshift Emergency Coordinator (continued)

Protective measures

Perform the following actions as required:

IF...	THEN...
a change to the emergency classification or Protective Action Recommendation is indicated	Direct the Satellite Technical Support Center Communicator to complete and transmit For EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms) to offsite agencies within 15 minutes of emergency classification.
the **Satellite Technical Support Center** is deemed **uninhabitable**	Authorize emergency exposures as necessary. Adjust stay times of Satellite Technical Support Center personnel to minimize exposure. Relocate personnel to an Unaffected Unit Satellite Technical Support Center, if necessary.
use of **Potassium Iodide** is indicated	Consult with the Radiation Protection Monitor regarding the use of Potassium Iodide and authorize administration of Potassium Iodide to personnel. Appendix K - Emergency Exposures and KI may be used for guidance.
the **Operations Support Center** is deemed **uninhabitable**	Direct the relocation of staff, equipment, and supplies to an Alternate Operations Support Center in a designated Unaffected Unit. Ensure that radiological precautions are observed.
a **fire** response is indicated	Implement 14DP-0FP32, Emergency Notification and Response, and dispatch the Fire Team and Fire Team Advisor. If required, instruct the Security Director to contact the offsite fire department for assistance.
a **medical** response is indicated	Implement 14DP-0FP32, Emergency Notification and Response, and 14DP-0FP11, Emergency Medical Response. Contact x4444 and advise. If necessary, dispatch an emergency medical team and coordinate any required offsite assistance.

5.2 Subsequent Actions - Onshift Emergency Coordinator (continued)

Security

Perform the following actions as required:

IF...	THEN...
offsite assistance is required	Request the Security Director to call the appropriate organizations and arrange for access when assistance arrives (6470 / 6471 / 6472, 4444, or dedicated line or radio).
site access needs to be restricted	Instruct the Security Director to limit access to PVNGS and to contact the Local Law Enforcement Agency for assistance, if required.
site access is required for offsite assistance personnel	Instruct the Security Director to arrange access for personnel not registered on the Emergency Response Personnel Access List and/or those individuals without Protected Area access.

Repairs

Perform the following actions as required:

IF...	THEN...
inplant status information is required	Determine the scope of emergency repairs, radiological surveys, etc. Authorize team dispatch via the RPM interface.
an **accident sample** is required	Direct Chemistry to initiate the actions necessary to obtain accident sampling and analysis per Appendix L - Accident Sampling.
the disposition of **contaminated water in secondary systems is required**	Implement 74DP-9ZZ14, Contaminated Water Management Program.

5.2 Subsequent Actions - Onshift Emergency Coordinator (continued)

Turnover of Duties

___ When consulted by the Onsite Emergency Coordinator (EC) or OSC Coordinator in an **Alert** or higher emergency classification, provide a briefing on the following items:

- initiating event
- emergency classification(s)
- current plant status
- procedures in use
- corrective actions applied thus far

___ When both the Satellite Technical Support Center Communicator and the Radiation Protection Monitor have been relieved of their duties, transfer EC duties and responsibilities to the Onsite Emergency Coordinator, and transfer OSC duties and responsibilities to the OSC Coordinator and the Repairs Coordinator.

___ Ensure that the USNRC Liaision in the Technical Support Center has assumed continuous communications capabilities with the USNRC.

5.3 Terminal Actions - Onshift Emergency Coordinator

Event Downgrade

___ Address the following items prior to downgrading the event:

- Conditions requiring the current emergency classification level no longer exist.
- The anticipated plant response is such that there should be no degradation to any fission product barriers or increase in radiation releases.
- Present plant conditions are such that there is no possibility of an adverse impact on the health and safety of the public and plant personnel due to actions associated with event downgrade.
- Consultation with government agencies and the Emergency Operations Director, if appropriate, has taken place.

___ Transmit the following message over the Unit Evacuation System: **"Attention all plant personnel. Attention all plant personnel. The emergency situation declared in Unit ___ has now been downgraded to a ________________."**

Provide special instructions as necessary. Repeat the message once. This responsibility can be delegated.

5.3 Terminal Actions - Onshift Emergency Coordinator (continued)

Event Termination

___ Address the following items prior to terminating the event:

- **The anticipated plant response** is such that there should be no challenge to any fission product barriers or radiation releases in excess of Technical Specifications.
- **Present plant conditions** offer no possibility of an adverse impact on the health and safety of the public and plant personnel.
- **Consultation with government** agencies and the Emergency Operations Director, if appropriate, has taken place.

___ **If Assembly had been initiated,** sound the "All Clear" Signal for approximately 30 seconds.

___ Transmit the following message over the Unit Evacuation System: **"Attention all plant personnel. Attention all plant personnel. The emergency situation declared in Unit ___ has now been terminated."** Provide special instructions as necessary. As appropriate, repeat sounding the "All Clear" Signal and the message once. This responsibility can be delegated.

___ Direct the **Satellite Technical Support Center Communicator to complete the Form EP-0543, Emergency Termination Message Form** (see Appendix C - Forms) and transmit it to those government agencies listed on the form.

___ Direct the **Shift Technical Advisor to notify the USNRC** as soon as possible of emergency termination.

___ **Notify the Unaffected Units' Shift Managers** of emergency termination.

___ At termination of the emergency classification, **notify the PVNGS Nuclear Regulatory Affairs Department** or the respective Unit Duty Engineer and request a written summary be provided to state / county offsite authorities within 8 hours (5 days if terminated from a Notification of Unusual Event). Provide copies of required materials, as requested by the Nuclear Regulatory Affairs Department, for preparation of the report.

Record Retention

___ Transfer copies of all associated paperwork to the Emergency Planning Department. Forward all original paperwork to the Unit Operations Department for sorting, collating, and transfer to Nuclear Information Records Management.

6.0 SHIFT TECHNICAL ADVISOR ACTIONS

6.1 Initial Actions - Onshift Shift Technical Advisor

Continuing actions	___	On a continuing basis, independently verify the current emergency classification, assess the status of plant systems and critical plant parameters as directed, and communicate the findings to the Shift Manager.
ERDS	___	For an Alert or higher Emergency Classification, activate the Emergency Response Data System (ERDS) in accordance with Appendix E - ERDS Activation.
Contacting personnel	___	Contact technical support personnel as required.

6.1 Initial Actions - Unaffected Unit Shift Technical Advisor

Status assessment	___	When duties have been assumed and an informational briefing has been received, assess the status of plant systems and core thermohydraulic parameters on a continuing basis.
Plant Status	___	Establish contact with the Plant Status Technicians in the Technical Support Center and Emergency Operations Facility, if activated, and arrange a 3-way conference call for communicating 15-minute plant system status updates.

6.2 Subsequent Actions - Onshift Shift Technical Advisor

Continuing assistance	___	Continue independent verification of any changes to emergency classifications and communicate the findings to the SM / EC.
Continuing assessments	___	Continue assessments and assist Control Room personnel.
Periodic briefings	___	Periodically brief the Shift Manager concerning plant status, availability of support personnel, and corrective action recommendations.

6.2 Subsequent Actions - Unaffected Unit Shift Technical Advisor

Status assessment	___	Continue assessments of plant systems and core therohydraulic parameters.

6.2 Subsequent Actions - Unaffected Unit Shift Technical Advisor

Core Damage Assessment	___	Perform Core Damage Assessment per Appendix G - Core Damage Assessment.
Status Updates	___	Provide a status of plant conditions to the Emergency Coordinator and Radiation Protection Monitor on a periodic basis.
Complete worksheeet	___	Obtain an Event Notification Worksheet from the Event Reporting Manual and complete the form fields as completely as possible.
USNRC notification	___	Using the Event Notification Worksheet and within 1 hour of initial, upgraded, or downgraded emergency classification, notify the USNRC Operations Center via the ENS NRC telephone. Dialing a "1" prefix is not necessary when calling the NRC.
USNRC Contact	___	Maintain contact with the USNRC until relieved by the USNRC Liaison Operations in the Technical Support Center.
Core Thermohydraulics	___	Maintain assessments of plant systems and core thermohydraulic parameters until relieved by the Reactor Analyst in the Technical Support Center.
Onshift Support	___	Provide support to the Onshift Shift Technical Advisor as required.

6.3 Terminal Actions

	___	All Shift Technical Advisors will submit logs, data, and other documentation to the Shift Manager after event termination.

7.0 RP MONITOR ACTIONS

7.1 Initial Actions

Facility activation

___ Receive briefing from EC.

___ Brief EC on current radiological conditions as known:
- Discuss need for control of AO movement as necessary.
- Discuss OSC control and briefing needs.

___ Obtain initial Met Data, plant conditions and RMS data.

7.1.1 First actions

First actions

Perform these actions as soon as practical following activation.

IF...	THEN...
an Alert or higher classification exists and there are indications of a release ongoing.	Deploy at least 1 offsite survey team * within 30 minutes following emergency declaration. The team may be dispatched for surveys, advised to stand by, or secured from activities if no radiation release is apparent.
indications of a release exist or are imminent	Perform dose projections (see Appendix F - Dose Projection) and issue an initial PAR (see Appendix B - Protective Action Recommendations) based on dose projections.

* - Contact the WRF Control Room at 3007/3002 to dispatch a field team driver.

7.2 Subsequent actions

Review actions

Continually review the following actions for performance as required.

IF...	THEN...
changing radiological conditions exist	Establish control over AO movement by working with the EC. If necessary, have all AOs sign in on the Emergency REP and obtain EPDs.
dispatch of teams is required	• Establish control over personnel by working with the EC to follow the "Emergency Team Dispatch Guidelines." • Provide radiological briefings to the ERO teams.
changing radiological conditions exist	• Monitor location of Security Personnel by contacting Security Director. Work with Security Director to move Security Personnel as necessary until TSC activation. • Monitor plume pathway and move onsite personnel as necessary to minimize dose - Water Rec Facility, Neutrino Facility, Buildings A-X, warehouses, etc. • Monitor plume pathway and discuss incoming and outgoing personnel movement with EC.

7.2.1 Emergency team dispatch guidelines

Inplant and Protected Area repair team dispatch and control

Coordinate repetitive implementation of the following with the EC and direct the available ERO staff to prepare and dispatch inplant and Protected Area teams.

___ Keep the Emergency Coordinator advised on all personnel resource availability.

___ Prioritize team entries and dedicate resources per the following guidelines and in accordance with the EC's direction:

Primary:
- Immediate entry needed for life or equipment saving
- 10 CFR 20 exposure limits may be exceeded
- Appendix K - Emergency Exposures and KI may be used.
- Radiation Protection personnel will accompany the team.

Secondary:
- No life or equipment saving actions
- PVNGS Administrative Exposure Hold Points may be exceeded
- Appendix K - Emergency Exposures and KI may be used.
- A pre-entry survey will be completed

Normal:
- No life or equipment saving actions
- No dose limits exceeded

___ Conduct or direct briefings with team members (the EC or Control Room Staff will assist for specific job detail). Establish radiation protection equipment requirements and identify any hold (or abort) points at significant segments for the mission.

___ Use the EP-0131 Briefing Forms (see Appendix C - Forms) to document each team <u>dispatch</u> and each team <u>debrief</u> on their return.

7.2.2 Radiological Field Assessment Team (RFAT) dispatch

Radiological Field Assessment Team (RFAT) dispatch

___ Select RFAT Team members and give them the initial radiological and meteorological information to safely reach the RFAT vehicle. A driver from the Water Reclamation Facility may be used during onshift response. The driver should be given an initial briefing per TelCon.

___ Instruct the field team members to proceed to their Radiological Field Assessment Team (RFAT) vehicles and establish radio communication.

___ When the vehicle radio communications checks have been completed, provide a specific briefing to team members regarding current survey requirements, current radioactive release details and survey assignments.

___ If any of the below thresholds are found to be met or exceeded, the RFAT Team shall immediately inform either the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Assessment Coordinator in the Emergency Operations Facility. These may impact the current classification and must be passed to the Emergency Coordinator as soon as possible.

Threshold	Site Boundary Dose Rate
NUE	> 0.1 mRem/hr Deep Dose Equivalent
Alert	> 1.0 mRem/hr Deep Dose Equivalent
SAE	> 100 mRem/hr Deep Dose Equivalent
	> 500 mRem/hr Thyroid CDE
GE	> 1000 mRem/hr Deep Dose Equivalent
	> 5000 mRem/hr Thyroid CDE

___ RFAT Teams will locate and track the radioactive plume by determining plume edge and centerline dose rates and surveying as directed. The criteria for Emergency Action Levels are based on Plume Centerline values; therefore varying dose rates or changing conditions shall be immediately brought to the attention of the RAC.

The following indications of a plume are typical:

Slowly increasing dose / count rate:	*approaching plume edge*
Sharp increase in dose rate:	*reached plume edge*
Highest instrument reading:	*reached plume centerline*
Open window > closed window reading:	*immersed in plume*
Open window = closed window reading:	*plume overhead (shine)*
Ground level > waist level reading:	*ground deposition present*

7.2.3 Radiological Field Assessment Team (RFAT) dispatch, continued

Radiological Field Assessment Team (RFAT) dispatch (continued)

___ Once the plume is located, the RFAT Team will radio in their current location and plume information, and obtain specific direction on dose rates and air samples to be taken. The RFAT Teams will supply only OW/CW dose rate readings; beta corrections to actual dose will be done onsite.

___ RFAT air sampling shall be performed in accordance with 75RP-9RP07, Radiological Surveys. (<10 cubic feet air samples may be taken for ALARA considerations.)

___ RFAT iodine cartridges should be purged in clean air for 30 seconds after sampling to aid in removal of noble gases.

___ All dose rates and air sample calculations performed by the field team members shall be documented on Form EP-0481, Air Sample Data (see Appendix C - Forms).

___ RFAT Team members are responsible for monitoring their individual doses and ensuring they remain within the limits set by the RPM/RAC Staff.

7.2.4 Procedural guidance

Procedural guidance

Refer to the following appendices or procedures as required.

IF...	THEN...
accident condition sampling is required using the PASS, the High Range RMS skids or other sample paths	Appendix L - Accident Sampling
assembly / accountability is called	Appendix I - Assembly
Containment entry	40DP-9ZZ01, Containment Entry Modes 1-4 (Operations primarily responsible, but RMS review prior to entry is required)
dose extensions	Appendix K - Emergency Exposures and KI
dose projections	Appendix F - Dose Projection Appendix R - Dose Projection Technical Bases
EDE / TEDE SID limits to be issued to affected teams	Appendix R - Dose Projection Technical Bases, section 1.9, External EDE/TEDE Ratios
Met data is not available via ERFDADS	Appendix F - Dose Projection, page 138 (Note)
Protective Action Recommendations are required	Appendix B - Protective Action Recommendations Also review Appendix A - Emergency Action Levels, Radiological Event Category (Modes 1-6 and defueled unless specified)
Potassium Iodide administration is indicated	Appendix K - Emergency Exposures and KI
site evacuation is called	Appendix J - Site Evacuation

7.3 Terminal actions

Turnover of duties	___	Transfer onsite and inplant responsibilities to the Radiological Protection Coordinator in the Technical Support Center.
	___	Transfer offsite responsibilities to the Radiological Assessment Coordinator in the Emergency Operations Facility.
	___	After the above transfers are completed, remain in the STSC to provide habitability surveys, and to stay current with Operations activities. Update the EOF, TSC, and OSC as appropriate based on conditions and events.
Radiation instrumentation	___	Ensure that dose rate meters from the emergency kit are transmitted to the calibration facility for calibration and required maintenance.
Record retention	___	Submit logs, data, and other documentation to the Emergency. Coordinator or Shift Manager after event termination.

8.0 SATELLITE TECHNICAL SUPPORT CENTER COMMUNICATOR ACTIONS

NOTE

Notifications to offsite agencies shall commence, via the NAN, within 15 minutes following initial, upgraded, or downgraded emergency declarations, and within 15 minutes following each change in the current Protective Action Recommendation.

8.1 Initial Actions

Facility Activation ___ When notified to report to the Control Room / Satellite Technical Support Center, report to the facility for an Emergency Coordinator briefing.

Offsite notifications ___ As directed, perform the actions associated with initial offsite agency notifications (see Appendix D - Notification).

8.2 Subsequent Actions

Status updates ___ Keep the Emergency Coordinator advised of issues or potential problems regarding the notification process.

Duty transfer to EOF Government Liaison ___ Transfer duties and responsibilities for offsite notifications to the Government Liaison in the Emergency Operations Facility when contacted.

Updating EOF on latest message ___ If requested, transmit a copy of the current Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms), by fax to the Emergency Operations Facility.

Duties after EOF relief ___ Maintain communications and logs for the facility as required. If EOF is no longer able to perform offsite agency notifications, that duty may be transferred back to the STSC Communicator.

8.3 Terminal Actions

___ Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

9.0 OPERATIONS ADVISOR ACTIONS

9.1 Initial Actions

Facility Activation	___	After duties have been assumed and an informational briefing has been received, consult with the Control Room Shift Manager and determine the technical / operational aspects of the event(s) in progress.

9.2 Subsequent Actions

Facility activation	___	When contacted by the Operations Coordinator in the Technical Support Center, provide the technical and operational aspects of the event(s) in progress to the Operations Coordinator, when appropriate.
Providing guidance	___	As required, provide technical and operational guidance to the Emergency Coordinator and Operations personnel.
Assisting operations	___	Assist, as necessary, in reclassification of the emergency and in any development of procedures for emergency operations.
Containment entry	___	Provide analysis of containment conditions prior to entry per 40DP-9ZZ01, Containment Entry in Modes 1 Through 4.

9.3 Terminal Actions

	___	Submit logs, data, and other documentation to the Shift Manager after event termination.

10.0 TERMINAL ACTIONS

Terminal Actions - Onshift Emergency Coordinator

Event Termination

___ Address the following items prior to terminating the event:

- The **anticipated plant response** is such that there should be no challenge to any fission product barriers or radiation releases in excess of Technical Specifications.
- **Present plant conditions** offer no possibility of an adverse impact on the health and safety of the public and plant personnel.
- **Consultation with government** agencies and the Emergency Operations Director, if appropriate, has taken place.

___ **If Assembly had been initiated,** sound the "All Clear" Signal for approximately 30 seconds.

___ Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The emergency situation declared in Unit ___ has now been terminated." Provide special instructions as necessary. As appropriate, repeat sounding the "All Clear" Signal and the message once. This responsibility can be delegated.

___ Direct the **Satellite Technical Support Center Communicator to complete the Form EP-0543, Emergency Termination Message Form** (see Appendix C - Forms) and transmit it to those government agencies listed on the form.

___ Direct the **Shift Technical Advisor to notify the USNRC** as soon as possible of emergency termination.

___ **Notify the Unaffected Units' Shift Managers** of emergency termination.

___ At termination of the emergency classification, **notify the PVNGS Nuclear Regulatory Affairs Department** or the respective Unit Duty Engineer and request a written summary be provided to state / county offsite authorities within 8 hours (5 days if terminated from a Notification of Unusual Event). Provide copies of required materials, as requested by the Nuclear Regulatory Affairs Department, for preparation of the report.

Record Retention

___ Transfer copies of all associated paperwork to the Emergency Planning Department. Forward all original paperwork to the Unit Operations Department for sorting, collating, and transfer to Nuclear Information Records Management.

Appendix A - Emergency Action Levels

1.0 Precautions and limitations

1.1 The Emergency Action Levels in this section each incorporate an Emergency Action Level Identification Code (i.e., nn-nn) immediately following the Emergency Action Level statement. This code functions as a cross-reference to the PVNGS Emergency Action Level Technical Bases in Appendix Q - EAL Technical Bases. The first number corresponds to the EAL table number in this section. The second number corresponds to the sequential EAL within that table. The identification code number is also employed as data on PVNGS Emergency Message Forms.

1.2 Each entry in this section incorporates the industry generic Initiating Condition (IC) and the plant specific Emergency Action Level. The Initiating Condition should be reviewed to ensure the significance addressed by the Emergency Action Level is taken into consideration.

1.3 The plant operating Mode that existed at the time the event occurred, prior to any protective system or operator action initiated in response to the condition, is the applicable Mode of the Emergency Action Levels. If an event occurs, and a lower or higher plant operating Mode is reached before the emergency classification can be made, the declaration shall be based on the Mode that existed at the time the event occurred.

1.4 If a conflict exists in the classification level due to an Emergency Action Level discrepancy, the Emergency Action Level most accurately describing the condition should be applied when classifying the event.

1.5 If an indication of barrier challenge or failure exists which is inconsistent with the current emergency classification, rediagnose plant conditions and implement the emergency classification indicated.

1.6 If a more severe Fission Product Barrier "LOSS" Category in Section 3 has been met, then assume the "POTENTIAL LOSS" criteria of the associated category has been automatically satisfied.

1.7 Used in the context of a steam generator tube rupture as stated in the Fission Product Barrier Emergency Action Level [1-7], a "prolonged release of contaminated secondary coolant" encompasses a main steam line break, feedwater line break, stuck open steam generator safety and/or atmospheric dump valve(s), and plant cooldown (i.e., to Mode 5) while steaming the affected steam generator to atmosphere.

2.0 Instructions

2.1 Evaluate the following tables and determine the most accurate Emergency Action Level which is currently being met or exceeded.

Table 1: Fission Product Barrier Reference (Modes 1-4)					
FUEL CLAD BARRIER		**RCS BARRIER**		**CONTAINMENT BARRIER**	
POTENTIAL LOSS	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**
Highest valid CET temperature > 700°F [1-1] RVLMS level < 21% plenum [1-2]	Highest valid CET temperature > 1200°F [1-1] RCS activity > 300 μCi/gm Dose Equivalent I-131 [1-3] CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr, or RU-149 > 1.8E+06 mrem/hr [1-4]	RCS leak > 44 gpm [1-6] SGTR > 44 gpm [1-7] LOAF such that minimum acceptable feedwater flow cannot be maintained [1-8]	RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling, i.e., RCS at saturation conditions [1-6] SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1) [1-7]	CTMT pressure 50 psig and increasing [1-10] CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating [1-10] CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr, or RU-149 > 8.7E+09 mrem/hr [1-11] H2 concentration > 3.5% by volume [1-10] CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored within 15 min. [1-12]	Rapid unexplained CTMT pressure decrease following initial increase [1-10] CTMT pressure or sump level response not consistent with LOCA conditions [1-10] Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists [1-13] Release of contam. Secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage [1-14]
Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier [1-5]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier [1-9]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier [1-15]	
APPLY THE CRITERIA ABOVE TO THE CONDITIONS BELOW					
UNUSUAL EVENT (NUE)		Any loss OR any potential loss of Containment			
ALERT		Any loss OR any potential loss of either Fuel Clad or RCS			
SITE AREA EMERGENCY (SAE)		Loss of both Fuel Clad and RCS OR potential loss of both Fuel Clad and RCS OR potential loss of either Fuel Clad or RCS AND loss of any additional barrier			
GENERAL EMERGENCY (GE)		Loss of any two barriers AND potential loss of a third barrier			

Table 2: Electrical Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Loss of All Offsite Power to Essential Buses for > 15 Minutes Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses [2-1]	**IC - AC Power Capability to Essential Buses Reduced to a Single Power Source for > 15 Minutes Such That Any Additional Single Failure Would Result in Station Blackout** Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition: Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG) **OR** Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR) [2-3]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4 [2-5]	**IC - Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4 **AND** Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated [2-7]
IC - Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for > 15 Minutes Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled [2-2]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses During Cold Shutdown or Refueling Mode** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled [2-4]	**IC - Loss of All Vital DC Power** Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4 [2-6]	

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-1]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-8]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-14]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-17]
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-2]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-9]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-15]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-18]

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Unplanned radioactivity release which results in Site Boundary dose rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-3]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Unplanned radioactivity release which results in Site Boundary dose rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-10]		
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Site Boundary dose rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-4]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Site Boundary dose rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-11]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** Site Boundary dose rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary [3-16]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** Site Boundary dose rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary [3-19]

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit [3-5] (normal levels comprise the highest reading in the past 24 hours excluding the current peak value)	**IC - Release of Radioactive Material or Increases in Radiation Levels within the Facility that Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are: (1) > 15 mR/hr: RU-18 Control Room OR (2) > 5000 mR/hr: RU-155 Main Steam Support Structure RU-153c Auxiliary Bldg. 100' East RU-23 Chemistry Hot Laboratory RU-19 Fuel Building [3-12]		
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water [3-6]	**IC - Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel** Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal, i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication, such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur **AND** Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145 [3-13]		
IC - Fuel Clad Degradation RCS specific activity > Technical Specification allowable limits [3-7]			

Table 4: Leakage Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - RCS Leakage Unidentified or pressure boundary leakage> 10 gpm in Modes 1-4 [4-1]			
IC - RCS Leakage Identified leakage > 25 gpm in Modes 1-4 [4-1]			

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room for > 15 Minutes Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available [5-1]	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate a Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2 [5-4] (manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS Bus from the Control Room)	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2 [5-7]	**IC - Failure of Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is an Indication of an Extreme Challenge to the Ability to Cool the Core** Failure of RPS to complete an automatic reactor shutdown, i.e., subcritical, and manual shutdown was not successful when in Modes 1-2 AND CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained [5-11]
IC - Inability to Reach Required Shutdown Within Technical Specification Limits Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4 [5-2]	**IC - Inability to Maintain Plant in Cold Shutdown** Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6 [5-5]	**IC - Loss of Water Level in the Reactor Vessel that Has or Will Uncover Fuel in the Reactor Vessel** Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 40AO-9ZZ02, Excessive RCS Leakrate and Safety Analysis Operational Data) [5-8]	

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio [5-3]	**IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room with Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable** Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress [5-6]	**IC - Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown** Loss of any function, i.e., heat removal, reactivity control, or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4 [5-9]	
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system [5-3]		**IC - Inability to Monitor a Significant Transient in Progress** Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available [5-10]	

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification [6-1]	**IC - Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown** Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-9]	**IC - Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established** Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes [6-18]	
IC - Natural and Destructive Phenomena Affecting the Protected Area Explosion affecting the Protected Area resulting in visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-2]	**IC - Control Room Evacuation Has Been Initiated** Entry into 40AO-9ZZ18, Shutdown Outside the Control Room, or 40AO-9ZZ19, Control Room Fire, for Control Room evacuation [6-10]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area [6-3]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Vehicle/aircraft crash or missile impact affecting plant vital areas [6-11]		
IC - Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant [6-4]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Visible structural damage to any building containing safe shutdown equipment [6-12]		

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals [6-5]	**IC - Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses [6-13]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Valid "Strong Motion Accelerometer SystemTrigger" indicated on Seismic Warning Panel per 79IS-9SM01 [6-6]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment [6-14]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Tornado affecting the Protected Area [6-7]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity [6-15]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Flooding affecting the Protected Area [6-8]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58 [6-16]		
	IC - Natural and Destructive Phenomena Affecting the Plant Vital Area Flooding potentially affecting safety systems required for the current operating Mode [6-17]		

Table 7: Security Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant [7-1]	**IC - Security Event in a Plant Protected Area** Security event within the Protected Area (RE: 40DP-0OP07) [7-2]	**IC - Security Event in a Plant Vital Area** Security event within any vital area (RE: 40DP-0OP07) [7-3]	**IC - Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown** Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel [7-4]

Table 8: Miscellaneous Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Control Room assessment that an event has occurred affecting the Protected Area [8-1]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Control Room assessment that an event has occurred affecting the plant vital areas [8-3]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate actual or likely major failure of plant functions needed for protection of the public [8-5]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a General Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate: (1) actual or imminent substantial core degradation with potential for loss of CTMT, or (2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary [8-6]
IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event Other conditions exist which, in the judgment of the SM/EC, indicate a potential degradation of the level of safety of the plant [8-2]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert** Other conditions exist which, in the judgment of the SM/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted [8-4]		

Appendix B - Protective Action Recommendations

1.0 Precautions and limitations

1.1 In the event of a declaration of General Emergency, the response by the State of Arizona may involve actions to evacuate the public to include citizens out to ten miles in the Emergency Planning Zone. Note that the state's Protective Action Decision may differ from the site's Protective Action Recommendation.

1.2 The protective actions determined within this document are provided to offsite agencies as recommendations. Offsite agencies may employ conservative adjustments prior to issuing Protective Action Decisions. For this reason, it is essential that protective actions recommended to offsite agencies by PVNGS are accurate.

1.3 Environmental Protection Agency guidance stresses evacuation in lieu of shelter whenever possible. Shelter is appropriate only when evacuation cannot be implemented or when the duration of the release is expected to be shorter than the time period required to evacuate.

1.4 A Protective Action Recommendation may be based on the current emergency classification, current plant conditions, or on a dose projection. When a dose projection is unavailable or not applicable, the Protective Action Recommendation should be based on the current emergency classification or plant conditions.

1.5 The Emergency Operations Director shall be informed of the basis for all recommended protective actions submitted for issuance to the State of Arizona. The information should include any default or abnormal data used to determine the recommended protective action and a clarification of the effect these values may have on the recommended protective action.

1.6 If wind direction is unavailable from installed instrumentation and cannot be clearly determined by alternate means, e.g., the Unit 1 STA link to the RG system, the Protective Action Recommendation must be applied to all sectors. If ERFDADS is unavailable, meteorological information required by the Radiological Monitoring Technician can be obtained by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS. For this case, Delta-T will be derived by the Radiological Monitoring Technician. The Radiation Protection Monitor should ensure that the Emergency Coordinator is informed and that someone is sent to the Meteorological Tower for resolution of failure and to obtain local data, if possible.

2.0 PAR determination

2.1 Application of emergency classification

2.1.1 If any radiological thresholds in Section step 2.0 of Appendix A - Emergency Action Levels, exceed those which are appropriate for the current emergency classification, immediately inform the Emergency Coordinator that radiological conditions exist which warrant an escalation in the current emergency classification.

2.1.2 Using the PAR Table, ensure that the current Protective Action Recommendation meets the minimum required for the current emergency classification.

2.2 Application of plant conditions

2.2.1 Based on bounding projections for plant conditions, review possible radiological release paths / source terms with technical staff members.

2.2.2 If Radiological Field Assessment Team data is available, compare Site Boundary dose rates and sample results with the projections previously reviewed and select the most accurate Protective Action Recommendation appropriate to current plant conditions.

2.2.3 Compare the Protective Action Recommendation selected in the previous step with that selected as the minimum required for the current emergency classification and select the most conservative Protective Action Recommendation.

2.3 Application of dose projection

2.3.1 If dose projection results are available, compare the recommended protective action based on the most recent dose projection to that selected as the most conservative in the previous step and select the most appropriate Protective Action Recommendation.

2.3.2 Inform the Emergency Coordinator / Emergency Operations Director of the Protective Action Recommendation selected and the basis (i.e., defaults or abnormal data used and its effects) for the selected Protective Action Recommendation.

2.3.3 As time permits, complete Form EP-0381, Dose Projected PAR, and provide it to the Emergency Coordinator / Emergency Operations Director.

3.0 Protective Action Recommendations

3.1 Determine the appropriate protective actions using the table below and the RP Monitor's recommendations.

Protective Action Recommendations

CONDITION	RECOMMENDED ACTION
NOTIFICATION OF UNUSUAL EVENT or ALERT declared	NONE
SITE AREA EMERGENCY declared	SHELTER within a 2-mile radius
GENERAL EMERGENCY declared OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): 5 REM > TEDE ≥ 1 Rem 25 REM > TODE ≥ 5 Rem	EVACUATION for 2-mile radius and 5 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)
Large fission product inventory (> fuel clad gap activity) has been released to containment OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): TEDE ≥ 5 Rem TODE ≥ 25 Rem OR Imminent containment failure is projected such that a "puff" release > design leak rate will occur in conjunction with substantial core damage or large fission product inventory	EVACUATION for 5-mile radius and 10 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)

Wind from	Affected Sectors	Distance to S.B.	Wind from	Affected Sectors	Distance to S.B.
169-191	R-A-B	0.82 (A)	349-011	H-J-K	1.68 (J)
192-213	A-B-C	0.83 (B)	012-033	J-K-L	1.14 (K)
214-236	B-C-D	1.58 (C)	034-056	K-L-M	0.75 (L)
237-258	C-D-E	1.37 (D)	057-078	L-M-N	0.63 (M)
259-281	D-E-F	1.34 (E)	079-101	L-M-N-P-Q	0.62 (N)
282-303	E-F-G	1.28 (F)	102-123	M-N-P-Q-R	0.63 (P)
304-326	F-G-H	1.31 (G)	124-146	N-P-Q-R-A	0.74 (Q)
327-348	G-H-J	1.88 (H)	147-168	Q-R-A	0.83 (R)

Appendix C - Forms

TABLE OF CONTENTS

1.0 Precautions and limitations

1.1 Forms in this appendix are to be considered "samples." In accordance with 01DP-0AP01, Procedure Process," the user may copy a sample form from the procedure if the copy is legible enough to use.

1.2 Forms in this appendix are available on the PVNGS Local Area Network (LAN), on drive V:, in directory \Eplan\Forms.

2.0 Forms

2.1 Form EP-0010, Logistics Overview (sample)

FORM EP-0010A **PVNGS EMERGENCY PLANNING**

LOGISTICS OVERVIEW

Name: ____________________ **Time:** ____________ **Date:** ____________

A. ERO Shift Schedule *(describe any abnormalities)*:

____
____
____
____

B. Status of onsite emergency response facilities and equipment:

STSC: ____
TSC: ____
OSC: ____
EOF: ____

C. Additional manpower / equipment / documentation support needed *(status, problems, etc.)*:

____
____
____
____

D. American Nuclear Insurers *(ANI)* informed of current status *(if applicable, state comments)*:

____

E. Additional information *(if applicable)*:

____
____
____
____

2.2 Form EP-0011, Personnel Shift Staffing, page 1 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

***PERSONNEL SHIFT STAFFING** (Part 1 of 5)*

Complete the checklist below and the attached emergency response facility staffing sheets as necessary to ensure effective transition between shifts. Brief the EOD on staffing requirements, if applicable.

Complete the following items as soon as possible:

____ Staffing established for 2 shifts - EOD briefed as applicable

____ Individual staff members informed of shift assignment and time of shift work hours

____ Emergency response facility staffing boards updated to reflect shift schedules

Complete the following items at shift change:

____ Formal turnover for each position regarding emergency status and duties and responsibilities

____ Staff members briefed on any abnormalities or problems encountered or anticipated

____ Ensure facility managers brief off-going staff on the following items applicable to their facility:

- ____ significant events leading to current plant status
- ____ current emergency classification level
- ____ current Protective Action Recommendation and decisions by the State of AZ
- ____ radiological status
- ____ corrective actions taken thus far
- ____ prognosis on plant status and current state of the emergency

____ On-coming staff assumes duties and responsibilities for their respective positions

____ Shift change occurs

____ Facility managers advised on status of shift change

____ Emergency response facility staffing boards updated to reflect current staff members on shift

2.3 Form EP-0011, Personnel Shift Staffing, page 2 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

SATELLITE TECHNICAL SUPPORT CENTER *(Part 2 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Advisor			
Radiation Protection Monitor ◆			
Shift Technical Advisor ◆			
STSC Communicator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.4 Form EP-0011, Personnel Shift Staffing, page 3 of 5 (sample)

FORM EP-0011 D **PVNGS EMERGENCY PLANNING**

TECHNICAL SUPPORT CENTER *(Part 3 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Onsite Emergency Coordinator ◆			
Administrative Support (two)			
Chemistry Coordinator			
Electrical Engineering ◆			
Emergency Coordinator Technical Asst.			
Emergency Maintenance Coordinator ◆			
Mechanical Engineering ◆			
Operations Coordinator ◆			
Probabilistic Risk Assessment			
Radiation Protection Support Technician			
Radiological Protection Coordinator ◆			
Reactor Analyst ◆			
Safety Analysis Engineer			
Security Director ◆			
Shift Technical Advisor			
Technical Engineering Manager ◆			
USNRC Liaison Operations			
OTHER:			
Facility Advisor			
Plant Status Technician			
Shift Technical Advisor *(additional)*			

◆ - position required for facility activation

2.5 Form EP-0011, Personnel Shift Staffing, page 4 of 5 (sample)

FORM EP-0011c **PVNGS EMERGENCY PLANNING**

OPERATIONS SUPPORT CENTER *(Part 4 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Support Center Coordinator ◆			
Chemistry Technician			
Electrical Maintenance Technician			
Fire Protection / EMT			
Instrumentation and Control Technician			
Mechanical Maintenance Technician			
Radiation Protection Technician ◆			
Radiological Monitoring Technician			
Repairs Coordinator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.6 Form EP-0011, Personnel Shift Staffing, page 5 of 5 (sample)

FORM EP-0011 D **PVNGS EMERGENCY PLANNING**

EMERGENCY OPERATIONS FACILITY *(Part 5 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Emergency Operations Director ◆			
Administrative and Logistics Coordinator			
Administrative Support (two)			
Dose Assessment Health Physicist ◆			
Government Liaison ◆			
Information Coordinator			
Radiation Protection Support Technician			
Radiological Assessment Communicator			
Radiological Assessment Coordinator ◆			
Security Coordinator ◆			
Shift Technical Advisor			
Systems Engineering			
Technical Analysis Manager ◆			
USNRC Liaison Health Physics			
OTHER:			
Ass't Emergency Operations Director			
Facility Advisor			
Plant Status Technician			

◆ - position required for facility activation

2.7 Form EP-0012, Emergency Action Log (sample)

FORM EP-0012A **PVNGS EMERGENCY PLANNING**

EMERGENCY ACTION LOG

Name:	Position:	Facility:	Date:

TIME	*ACTION*

2.8 Form EP-0013, Duty Contact Register (sample)

FORM EP-0013B **PVNGS EMERGENCY PLANNING**

DUTY CONTACT REGISTER

INSTRUCTIONS

NOTE: Per 10 CFR 26.20(e), any individual offsite reporting for duty in the TSC and/or EOF shall be questioned on Fitness for Duty and the response(s) shall be recorded.

Complete the following information:

- print the following: individual name / current time / facility where reporting
- record both responses to the following questions in the appropriate blanks:

Question 1: ***"Have you abstained from alcohol for the past 5 hours?"***
Question 2: ***"Are you fit for duty?"***

Name of Individual	Time	For Facility...	Response(s) to Questions
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -

Reviewed by: ______________________ Date: ______________
(Signature)

Reviewer: Review / sign this form and submit it to the EC or EOD when completed. Ensure that the facility leader for each individual reporting for duty is made aware of any individual's condition where alcohol has been consumed.

2.9 Form EP-0021, FAX Cover (sample)

FORM EP-0021 A PVNGS EMERGENCY PLANNING

ARIZONA PUBLIC SERVICE COMPANY

Palo Verde Nuclear Generating Station

FAX Cover Sheet

TO: ______________________________

PHONE: ______________ | ______________
VOICE *FAX*

FROM: ______________________________

PHONE: ______________ | ______________
VOICE *FAX*

PAGES: ______________________________
INCLUDING FAX COVER SHEET

Emergency Planning

PALO VERDE

2.10 Form EP-0022, EOF Document Distribution (sample)

FORM EP-0022A **PVNGS EMERGENCY PLANNING**

EOF DOCUMENT DISTRIBUTION

Name: ____________________ **Date:** ____________ **Time:** ____________

Retrieve Form EP-0381 and the MESOREM print report from the RAC / Dose Assessment Health Physicist workstations and proceed to the copy machine. Make the following number of copies:

Form EP-0381: 12
MESOREM print report: 5 *(original may be several pages)*

Return the originals to the RAC / Dose Assessment Health Physicist workstations.

Distribute copies of both documents per the following lists *(some copies must be transmitted via FAX)*:

DOCUMENT	***POSITION TITLE***	***COPIES***	
Form EP-0381:	Arizona Radiation Regulatory Agency *(TOC)*	1	
	Emergency Operations Director *(EOF)*	1	
	Government Liaison *(EOF)*	1	
	Radiation Protection Support Technician *(EOF)*	1	
	Radiation Protection Technician *(OSC)*	1	
	Radiological Assessment Communicator *(EOF)*	1	
	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	Radiological Status Board *(EOF)*	1 *	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	
MESOREM Print Report:	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	

* replace the old form

2.11 Form EP-0030, Chemistry Status (sample)

FORM EP-0030A **PVNGS EMERGENCY PLANNING**

CHEMISTRY STATUS

Name:	Date:	Time:
SAMPLE ANALYSES		
Reactor Coolant System	***Containment***	***Secondary***
POST ACCIDENT SAMPLING EVALUATION		
RCS:		
Containment:		
RU-144:		
RU-146:		

STEAM GENERATOR HYDROGEN BUBBLE	**RECOMMENDATION TO REDUCE STEAM GENERATOR HYDROGEN**
#1 Steam Generator: Y *(____ %)* N	
#2 Steam Generator: Y *(____ %)* N	

COUNT ROOM STATUS

OTHER INFORMATION

2.12 Form EP-0051, Chemistry Cart #1 Preparation Checklist (sample)

FORM EP-0051 s **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #1 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This cart preparation can be used for obtaining either liquid or gas samples

MATERIALS	✓
Modified lead brick *(made to contain three 7-ml liquid vials)*	
Modified lead brick *(made to contain three 9.2-cc gas vials)*	
Adjustable pipettes *(with pipette tips)* in ranges to allow for sample distribution and dilutions	
Beaker with de-ionized water *(≥ 50 ml)*	
2 gas-tight *(twist-lock)* 1-cc syringes	
10-ml liquid syringe with a 1½-inch needle	
Plastic paper / plastic bags / parafilm to hold the 7-ml / 9.2-cc gas vial after final dilution and prior to counting	
Labels for chemistry samples	
1-inch thick lead carrying case *(pig)*	
Absorbent paper	
Three 9.2-cc gas vials with septums *(one of them evacuated by 0.1 cc)*	
Three 7-ml liquid vials with screw caps	
Needle-nose pliers	
Parafilm	
Lead bricks *(place one lead brick in front and one behind each of the modified dilution lead bricks)*	
Calculator	
Scissors	

COMMENTS

Prepared by: ______________________ (Signature) ______________ (Date)

2.13 Form EP-0052, Chemistry Cart #2 Preparation Checklist (sample)

FORM EP-0052A **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #2 PREPARATION CHECKLIST

Name:	Date:	Time:
NOTE: This cart preparation can be used for obtaining either liquid or gas samples as designated		

MATERIALS	
LIQUID:	
1-ml *(B-D)* liquid syringe	
6-inch syringe needle	
2-inch thick lead pig *(fabricated for a 3½-ml glass vial)*	
3½-ml glass vial	
Parafilm	
Temporary syringe disposal cask	
500-ml beaker *(for temporary disposal of used pipette tips, needles, etc.)*	
GAS:	
2 gas-tight *(twist-lock)* 1-cc syringes	
1-inck thick lead syringe carrying case	
Temporary syringe disposal cask	
Remote tools *(two sets may be needed if transporting to an Unaffected Unit)*	
Gas syringe carrying case *(aluminum case to accommodate syringe and handling tool)*	
BOTH - REMOTE TOOLS:	
Syringe handling tool *(two sets may be needed for gas sampling if a gas sample is to be transported to an Unaffected Unit)*	
Syringe locking / unlocking device	

COMMENTS

Prepared by: ______________________ (Signature) ______________ (Date)

2.14 Form EP-0053, Chemistry Cart #3 Preparation Checklist (sample)

FORM EP-0053A PVNGS EMERGENCY PLANNING

CHEMISTRY CART #3 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This checklist is generally performed by the Radiological Monitoring Technician and can be used for obtaining RMS HI-Range skid samples

MATERIALS	
Sample handling tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Latch handle tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Portable transfer pig	
KEPIC *(if required)*	
Loaded special RMS filter head	
Plastic bags	
Tweezers	
Petri dishes	
RMS keys	

COMMENTS

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Prepared by: ______________________ *(Signature)* ______________ *(Date)*

2.15 Form EP-0054, Accident Sample Worksheet (sample)

FORM EP-0054A **PVNGS EMERGENCY PLANNING**

ACCIDENT SAMPLE WORKSHEET

Name:		Date:	Time:
DOSE DATA			
(AS REQUIRED FOR SAMPLE TYPE)	***CONTACT***	***1-FOOT***	***3-FEET***
Septum Ports			
Syringe			
RMS Skid Working Area			
RMS Sample Chamber *(door open)*			
Top of Unshielded Sample in Pig			
Pig Top			
Pig Side			

SAMPLE DATA LOG

(AS REQUIRED FOR SAMPLE TYPE)

RU-________ Chamber # ________ Sample Volume ____________________ Cubic Feet
(original volume uncorrected for iodine plate-out)

Grab Sample Collection Duration ________ Seconds

Sample Start: Date: ________ Time: ________ Flow: ________ CFM

Sample Stop: Date: ________ Time: ________ Flow: ________ CFM

TEAM DATA

Team Number: ____________________

Team Members: ____________________ ____________________

____________________ ____________________

____________________ ____________________

COMMENTS

____

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____

Prepared by: ______________________ ______________
(Signature) *(Date)*

2.16 Form EP-0055, RMS Skid Collection Time Calculation (sample)

FORM EP-0055A PVNGS EMERGENCY PLANNING

RMS SKID COLLECTION TIME CALCULATION

Name:	Date:	Time:

RMS SKID SAMPLE DATA
SAMPLE COLLECTION TIME CALCULATION

Monitor Number: ______________

Monitor Reading *(M)*: ______________ μCi/cc Sample Flow: __________ CFM

Collection Time *(seconds)* Calculation:

$$T_{sec} = \frac{\text{Sample } (\mu Ci)}{(M) \times (R) \times (F) \times (472) \times (0.04)}$$

where:

T_{sec} and Sample μCi are variables - either a specific sample time or a specific sample activity may be entered and the other variable will be calculated. **Always ensure that the final sample activity will be below the 0.25 Ci sample counting limitation.**

M = current μCi/cc monitor indication

R = ratio of I/NG - use a known value from analysis *(if available)* or as below:
(based on UFSAR 6.3.3.6 Source Term for 100% failed fuel)

- 2.20E-02 I/NG for LOCA or Fuel Handling Accident
- 5.70E-04 I/NG for S/G Tube Leak condition

F = current sample flow *(not process)* in CFM

472 = net unit conversion factor: [*(cc/sec) divided by (ft^3/min)*]

0.04 = Iodine plate-out factor

NOTE

Select a collection time that is less than the calculated maximum.
If the calculated maximum is less than 60 seconds, use 60 seconds as the minimum time.

Calculated T value: _______ seconds Selected T value to be used: _______ seconds

Calculated by: ______________________________ Date: __________
(Signature)

Print Name: ______________________________

Reviewed by: ______________________________ Date: __________
(Signature)

2.17 Form EP-0130, Plant Maintenance Status (sample)

FORM EP-0130A **PVNGS EMERGENCY PLANNING**

PLANT MAINTENANCE STATUS

Name:	Date:	Time:

EQUIPMENT STATUS	
Damage	**Repair Effort*(s)***
Electrical:	Repair Team:
Mechanical:	Repair Team:
Instrumentation:	Repair Team:

TOOLS / SPARE PARTS
HAZARDS
Chemical:
Fire:
Medical:
Toxic:
WATER SUPPLY STATUS
Primary Systems:
Secondary Systems:
Spray Pond*(s)*:
MISCELLANEOUS
Radiological Condition*(s)*:
Decontamination:
Support Personnel:
TSC Panel AJ-SDN-UA-001 Status:

2.18 Form EP-0131, In-plant Team Briefing (sample)

FORM EP-0131A PVNGS EMERGENCY PLANNING

IN-PLANT TEAM BRIEFING

OSC Coordinator

TEAM IDENTIFICATION	Team Members: *(Ldr)*: ______
Team Name: ______	______ ______
Plant Location: ______	______ ______
Purpose: ______	______ ______

Radiation Protection

EXPECTED WORK AREA CONDITIONS	
REP Number:	Dose Rates:
Contamination:	Airborne: Respirator: Y N
PROTECTIVE REQUIREMENTS (In addition to those specified on REP)	
Dosimetry:	
PCs:	
Communications Links:	
SPECIAL INSTRUCTIONS	
Are Emergency Exposure/KI actions required for any team member? Y N	
If Y*(es)*, has required documentation been completed? Y N	
Hold Points:	
Abort Points Dose Rate: Dose: Time: Other:	

OSC Coordinator / Radiation Protection

BRIEFING	
Travel Route Summary:	
Personnel Hazards:	
Tools / Equipment:	
Additional Materials:	
Time Briefing Conducted:	Time Team Dispatched:
Conducted by:	Time Team Returned:
DEBRIEF COMMENTS	

2.19 Form EP-0231, Draft Information - NUE (sample)

FORM EP-0231 A PVNGS EMERGENCY PLANNING

NOTIFICATION OF UNUSUAL EVENT

DRAFT INFORMATION

Wintersburg, AZ -- A Notification of Unusual Event was declared at Palo Verde Nuclear Generating Station Unit ______ (*1 / 2 / 3*) on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Injuries - describe and indicate if contaminated**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material.

2.20 Form EP-0232, Draft Information - Alert (sample)

FORM EP-0232A PVNGS EMERGENCY PLANNING

ALERT

DRAFT INFORMATION

Wintersburg, AZ -- An Alert was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material *(if applicable)*.

2.21 Form EP-0233, Draft Information - SAE (sample)

FORM EP-0233A PVNGS EMERGENCY PLANNING

SITE AREA EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A Site Area Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.22 Form EP-0234, Draft Information - GE (sample)

FORM EP-0234A PVNGS EMERGENCY PLANNING

GENERAL EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A General Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.23 Form EP-0235, Site-Wide Announcement Worksheet (sample)

FORM EP-0235A PVNGS EMERGENCY PLANNING

SITE-WIDE ANNOUNCEMENT WORKSHEET

Name:	Facility:	Date:	Time:

INSTRUCTIONS

Complete the relevant blanks with a summary of information and perform a Site-Wide Announcement. Strike-out any portions not applicable to the event.

Attention all plant personnel -- Attention all plant personnel.

On ____________ (*date*) **at** ____________ (*time*)**, a(n)** ________________________ (*emergency classification*) **was**

declared in Unit ________ (*Unit*) **due to** ________________________ (*reason (see applicable EAL Status Codes)*).

Corrective actions applied have been ________________________ (*summary of corrective actions*)

________________________.

The current plant status is ________________________ (*information summary*).

A radiological release <u>**is**</u> <u>**is not**</u> **in progress at this time.**

The wind is currently <u>**from**</u> **the** ____________ (*direction*) **at** ________ (*speed*) **miles / hour.**

The current Protective Action Recommendation provided to the State of Arizona is:

________________________ (*from Emergency Operations Director or designee*).

Personnel injuries include ________________________ (*number and nature of injuries*).

Fire / hazardous chemical status is ________________________ (*information summary*).

Personnel Assembly was directed on ____________ (*date*) **at** ____________ (*time*).

Site Evacuation was directed on ____________ (*date*) **at** ____________ (*time*).

Specific Instructions: ________________________ (*information summary*)

________________________.

2.24 Form EP-0240, EC Turnover Summary (sample)

FORM EP-0240A **PVNGS EMERGENCY PLANNING**

EC TURNOVER SUMMARY

Onshift EC Name: ______________________	Date: __________
Onsite EC Name: ______________________	Time: __________

CURRENT CONDITIONS

Emergency Classification declared at: __________ (date) __________ (time) in Unit: ____

EAL Status Code*(s)*:

Initiating Event Summary:

Summary of Plant Status:

Procedure*(s)* in Use:

Corrective Action*(s)* Applied:

CRITICAL SAFETY FUNCTION STATUS

Safety Function*(s)* Currently Jeopardized:

PROTECTIVE ACTION RECOMMENDATIONS

Radiological Release? *(Y/N)*: Describe:

PAR issued: at: __________ (date) __________ (time)

State Protective Action Decision:

Medical / Fire / etc? *(Y/N)*: Describe:

OTHER INFORMATION

2.25 Form EP-0300, Authorization for Dose Beyond 10CFR20 limits (sample)

FORM EP-0300A **PVNGS EMERGENCY PLANNING**

AUTHORIZATION FOR DOSE BEYOND 10CFR20 LIMITS

Name:	Date:	Time:	Unit:

ORIGINATOR

Authorization Requested For:

Individual Name: ____________________

HPID: ________ SSN: ____________ REP Number: ____________

Reason for Request: ________________________________

DOSE REQUEST

Circle one limit in each column or enter a lower limit in the appropriate box of each column:

DOSE LIMITS	TEDE	TODE and Thyroid CDE	LDE	SDE
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM / year	50 REM * / year	15 REM / year	50 REM / year
EPA Guidance for Protecting Valuable Property	10 REM	100 REM	30 REM	100 REM
EPA Guidance for Life-Saving or Protection of Large Populations	≤ 25 REM	≤ 250 REM	≤ 75 REM	≤ 250 REM
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM	> 250 REM	> 75 REM	> 250 REM

* Sum of Deep Dose Equivalent and Committed Dose Equivalent *(DDE + CDE)*. EPA does not use TODE *(Total Organ Dose Equivalent)*; EPA uses CDE in this column. PVNGS assesses TODE and, via Emergency Exposure and KI guidelines and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

AUTHORIZATION AND APPROVAL

NOTE: **For dose authorizations > 25 REM, a risk discussion is required per 16IG-0EP051, Emergency Exposures and KI, Section 6, Team Briefing and Deployment, if time permits**

I have received NO previous life-saving exposure: ____________ *(radiation worker signature)* ______ *(date)*

If authorized dose > 25 REM, my assignment is voluntary and I have received a risk discussion briefing: ____________ *(radiation worker signature)* ______ *(date)*

I have reviewed my dose records. I am aware that, although dose received under this authorization is beyond 10 CFR 20 limits during the emergency, the dose received will be added to my dose records and subject to 10 CFR 20: ____________ *(radiation worker signature)* ______ *(date)*

Radiation Protection Monitor / Radiological Protection Coordinator: ____________ *(RPM / RPC signature)* ______ *(date)*

Authorized for dose requested as stated above: ____________ *(Emergency Coordinator signature)* ______ *(date)*

DOSIMETRY RECORD UPDATE

Dosimetry record update performed by:

____________ *(print)* ____________ *(signature)* ______ *(date)* ______ *(system)*

2.26 Form EP-0301, TLD Distribution (sample)

FORM EP-0301A **PVNGS EMERGENCY PLANNING**

TLD DISTRIBUTION

Monitor Name:	***Date:***
Location:	

Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		

PV216-08M (8-88)

2.27 Form EP-0330, Plant Status Overview (sample)

FORM EP-0330 a PVNGS EMERGENCY PLANNING

PLANT STATUS OVERVIEW

TIME: DATE: EMERGENCY CLASS: PALO VERDE UNIT: Mw CE POWER:

REACTOR

POWER LEVEL: TREND
%
CORE EXIT TEMP:
°F
HIGHEST INCORE THERMOCOUPLE TEMP:
°F
RX VESSEL WATER LEVEL:
HEAD %
PLNM %
SHUTDOWN (Y/N):
CONTROL RODS IN (Y/N):
COOLING METHOD:
EMERGENCY BORATE (Y/N):
BORON CONC (ppm):

PRIMARY COOLANT

RCP AUX. AVAIL. (Y/N)
1A 1B 2A 2B
RCP's RUNNING (Y/N):
1A 1B 2A 2B
LOOP T-COLD (°F):
1A 1B 2A 2B
LOOP T-HOT (°F):
1 2
TEMP SUBCOOL: TREND
°F
PRESSURIZER PRESSURE:
PSIA
PRESSURIZER LEVEL:
%
PRESSURIZER TEMP:
°F
RDT LEVEL: %
LEVEL CONTROL METHOD:
GAS CONC (CC stm/kg):
H^2 N^2 Xe Kr
SPEC ACTIVITY (uCi/ml):
TOTAL: I:

ECCS

SIAS (Y/N):
HPSI PUMPS RUNNING(Y/N):
SIA SIB
HPSI FLOW (GPM):
1A: 1B:
2A: 2B:
HL1: HL2:
CHARGING FLOW:
GPM
LPSI PUMPS:
A: GPM
B: GPM
RWT LEVEL: TREND
%
SIT LEVEL (% WR):
1A 1B
2A 2B

SECONDARY PLANT

STEAM GENERATORS
LEVEL (% WR):
1 2
PRESSURE (PSIA):
1 2
ISOLATED (Y/N):
1 2
MAIN FEED FLOW (LBM/HR):
1 2
AUXILIARY FEEDWATER
RUNNING:
A / B / N
AUX FEED FLOW:
SG1: GPM
SG2: GPM
TOTAL FLOW: TREND
SG1: GPM
SG2: GPM
CST LEVEL: FT
ADVs IN USE (Y/N):
SBCS IN USE (Y/N):

CONTAINMENT

CIAS (Y/N):
CSAS (Y/N):
ISOLATED (Y/N):
PRESSURE: TREND
PSIG
TEMPERATURE:
°F
H^2 CONCENTRATION (%)
A: B:
CONTAINMENT SPRAY:
A: B:
SUMP LEVEL: TREND
A: IN
B: IN
RADIATION:
RU148 mR/HR
RU149 mR/HR
RECOMBINERS (Y/N):
A: B:
AIR COOLERS:
A B C D
SPEC CONC (uCi/ml):
TOTAL: I:

ELECTRICAL

OFFSITE AC (Y/N):
ONSITE POWER (Y/N):
DIESEL GENERATORS:
A: VAC
B: VAC
VITAL BUS STATUS:
PBAS03: VAC
PBBS04: VAC
125 VDC:
PKA PKB
PKC PKD
UPS STATUS:

COMMENTS:

2.28 Form EP-0350, Radiological Status (sample)

FORM EP-0350A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL STATUS

Date: Time: Accident Unit *(1 / 2 / 3 / common)*:

RELEASE PATH USED FOR PROJECTION

☐ Steam Generator Tube Rupture *(1% failed fuel)*
☐ Steam Generator Tube Rupture *(100% failed fuel)*
☐ LOCA *(1% failed fuel)*
☐ LOCA *(100% failed fuel)*
☐ Isolated Containment
☐ Fuel Handling Accident
☐ Waste Gas Decay Tank Accident
☐ Unmonitored Release Accident

Emergency initially declared: Time *(hh:mm)*. ____________ Date *(mm/dd/yy)*: ______________

Is a release currently in progress? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: ______________

Release rate *(if known)*: Iodine: ________________ µCi/sec Noble Gas: ________________ µCi/sec

Simultaneous release? ☐ Yes ☐ No

Expected total release duration *(hh:mm)*: ____________ *(default = 02:00)*

Has the reactor been scrammed? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: ______________

METEOROLOGICAL DATA

Weather: ☐ Normal ☐ Adverse Wind Speed is _______ *(at 35 feet)* mph from _______ *(at 35 feet)* degrees

Δ-T: _______ Ambient temperature: _______

CURRENT RADIATION MONITORING SYSTEM DATA

RMS Monitor: ___________ RMS Monitor Reading: ___________ µCi/cc or ___________ mrem/hr

Process Flowrate: ______________ cfm Iodine Filtration: ______________ % *(default = 95%)*

Grab sample analysis: ☐ Complete *(see below)* ☐ Incomplete

MISCELLANEOUS INFORMATION

Isolated Containment *(leakage)*: ☐ 852 cc/sec *(default)* ☐ Other. ______________ cc/sec

NOTE: Maximum steam flow *(or 100% open valve position)* will result in a very conservative release projection. Validate the release projection with field team data as soon as practicable.

S/G Tube Rupture: Affected loop Hot Leg temperature *(if steam release from S/G)*: ________ °F
Affected steam line flow rate: ______________ lbm/hr *(from ERFDADS or CR)*

S/G level > 97% WR or indication of liquid entrained release? ☐ Yes ☐ No

Fuel Handling Accident: Fuel assembly age *(time since last critical)*: ________ hours *(from Rx Eng or STA)*

Waste Gas Decay Tank: Elapsed time since isolated: ________ hours *(maximum 999 hours)*

GRAB SAMPLE ANALYSES

Sample Number. ______________ Sample analysis time *(hh:mm)*: __________

Comments:

Name: ______________ *(print)* Position. ______________ *(ERO)*

2.29 Form EP-0381, Dose Projected PAR (sample)

FORM EP-0381 c **PVNGS EMERGENCY PLANNING**

DOSE PROJECTED PAR

Date: ____________ Time: ____________

A release at this time is *(circle one)*: **in progress** **not in progress**

The release is *(circle one)*: **monitored** **unmonitored** **N/A**

The release is *(circle one)*: **filtered** **unfiltered** **N/A**

The release pathway is *(check all that apply)*:

☐ Containment ☐ Plant Vent ☐ Fuel Building ☐ Steam Line ☐ N/A

☐ Other: ____________________________________

RMS Monitor: ____________ RMS Monitor Reading: ____________________

The expected release duration is: ________ hours *(default = 2 hours)*

15 minute average wind speed is ________ *(at 35 feet)* mph from ________ *(at 35 feet)* degrees

MESOREM projected Stability Class is *(circle one)*:
A B C D E F G
A *(unstable)* D *(neutral)* G *(stable)*

MESOREM projected Mixing Depth: ________ meters

MESOREM projected release rates *(µCi/sec)* are:

Iodine. ______________________ Noble Gas: ______________________

Time since scram: _____ Hrs _____ Min *(from STA)* Release in progress: _____ Hrs _____ Min *(from STA)*

The plume centerline projected dose *(in mrem)* based on a _____ - hour release is:

Distance	Sector(s)	TEDE	Thyroid CDE	TODE
SB				
2 miles				
5 miles				
10 miles				

NOTE: As a minimum, enter data for the Site Boundary (SB) fields

PAR: ____

2.30 Form EP-0481, Air Sample Data (sample)

FORM EP-0481 B **PVNGS EMERGENCY PLANNING**

AIR SAMPLE DATA

Sample Number:	Sample Date:	Sample Time:
Sample Location:		

PARTICULATE

Filter *(net cpm)*	X	Calculation Constant ★	=	Particulate Concentration	
________	X	1.6E-11	=	________	μCi/cc

IODINE *(Label Iodine cartridge for transport to laboratory)*

If frisker is on-scale, Silver Zeolite *(net cpm)*	X	Calculation Constant ★	=	Iodine Concentration	
________	X	3.2E-11	=	________	μCi/cc

If frisker is off-scale-HI, obtain a closed-window RO-2 contact reading *(mrem/hr)* on the cartridge and multiply the RO-2 reading by the appropriate conversion factor and by 1.0E-06 to obtain a μCi/cc value:

(RO-2 closed-window reading)	X	(Conversion Factor)	X	(1.0E-06)	=	(I^{131} Equiv. Concentration in μCi/cc)	
________	X	________	X	1.0E-06	=	________	μCi/cc

Multiply the I^{131} Equiv. Concentration by 1.3E+06 to obtain the equivalent Thyroid CDE dose rate:

________ μCi/cc *(previous line)* X 1.3E+06 = ________ REM / hour

Hours Since Reactor Shutdown:	0 - 4	5 - 7	8 - 12	13 - 18	19 - 24	25 - 36	> 36
Conversion Factor:	2	3	4	6	7	10	20

NOBLE GAS *(Label Noble Gas samples for transport to laboratory)*

★ The displayed Calculation Constant is based on an assumed sample volume of 10 cubic feet. For sample volumes other than 10 cubic feet, multiply concentration by 10 and divide by actual sample volume *(cubic feet)*.

2.31 Form EP-0482, Field Team Survey (sample)

FORM EP-0482A **PVNGS EMERGENCY PLANNING**

FIELD TEAM SURVEY

DATE:							
		DOSE RATES *(mrem/hr)*				AIR SAMPLES	
		3 FEET		3 INCHES		*(µCi/cc)*	*(µCi/cc)*
TIME	LOCATION	WO	WC	WO	WC	PART	IODINE

2.32 Form EP-0483, Field Team Plume Sample (sample)

FORM EP-0483 s **PVNGS EMERGENCY PLANNING**

FIELD TEAM PLUME SAMPLE

RFAT NUMBER:	TIME:	
PLUME LOCATIONS		
1. EDGE:		
2. CENTERLINE:		
3. EDGE:		
CENTERLINE SURVEY DATA		
	3 FEET	**3 INCHES**
OPEN WINDOW *(mrem/hr)* - GROSS UNCORRECTED READING -		
CLOSED WINDOW *(mrem/hr)*		

PARTICULATE CONCENTRATION	=	____________	µCi/cc
divided by 3.00E-09 µCi/cc per DAC	=	____________	DAC
times 2.5 mrem/hr per DAC	=	____________	mrem/hr CEDE
IODINE CONCENTRATION	=	____________	µCi/cc
divided by 2.00E-08 µCi/cc per DAC	=	____________	DAC
times 25 mrem/hr per DAC	=	____________	mrem/hr Thyroid CDE

TEAM EXPOSURE		
NAME:		
EXTERNAL EDE *(mrem)*		
DAC-Hours		
Time in Plume		

(Authorized TEDE X selected External EDE / TEDE ratio = Allowed External EDE mrem)

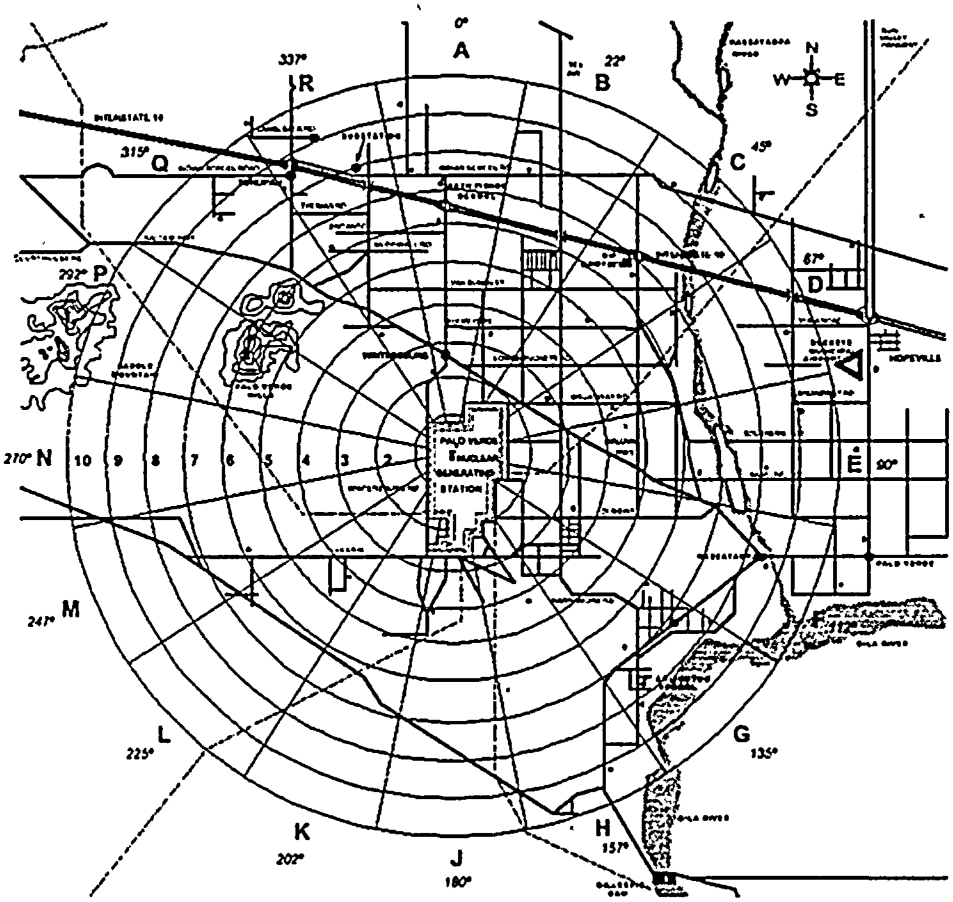
OTHER INFORMATION

NOTE Information for identified fields represents the minimum to be reported

2.33 Form EP-0484, Plume Data Map (sample)

FORM EP-0484 A **PVNGS EMERGENCY PLANNING**

PLUME DATA MAP



DATE: ____________ TIME: ____________ Rx TRIP TIME: ____________

START OF RELEASE: ____________ ____________ STABILITY CLASS: ____________
(DATE) (TIME)

WIND: ____________ MPH FROM ____________

2.34 Form EP-0500, Radiological Protection Summary (sample)

FORM EP-0500A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL PROTECTION SUMMARY

DATE: TIME:

EMERGENCY CLASSIFICATION: **NUE** **ALERT** **SAE** **GE**

Radiological Events Driving Classification:

Radiological Status:

- A release **IS** **IS NOT** in progress at this time from ____________________ *(release point)*
- Current wind speed is ______ mph at 35' elevation from ______ degrees at 35' elevation

Corrective Actions Implemented:

PVNGS PROTECTIVE ACTION RECOMMENDATIONS	***GOVERNMENT PROTECTIVE ACTION DECISIONS***

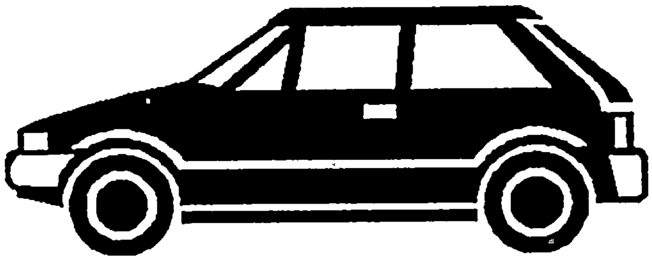
Plant Activities (circle appropriately):

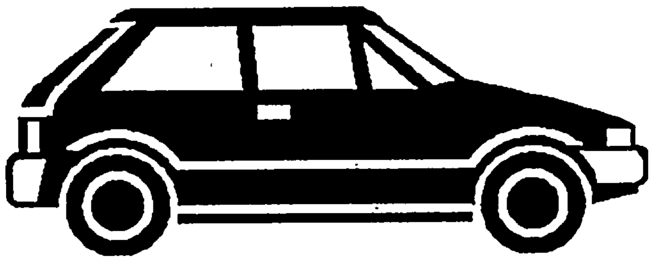
- ASSEMBLY ACCOUNTABILITY EVACUATION
- CONTAMINATED INJURIES LIFE-THREATENING INJURIES
- OTHER:

2.35 Form EP-0501, Vehicle Decontamination (sample)

FORM EP-0501 A PVNGS EMERGENCY PLANNING

VEHICLE DECONTAMINATION





Monitor Name:		Date:	Time:
Vehicle Reg:	Owner:	Address:	
City:	State: ZIP:	Telephone:	

CONTAMINATION

Location Outside Vehicle (describe):

Location Inside Vehicle (describe):

Location in Engine Compartment (describe):

Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*

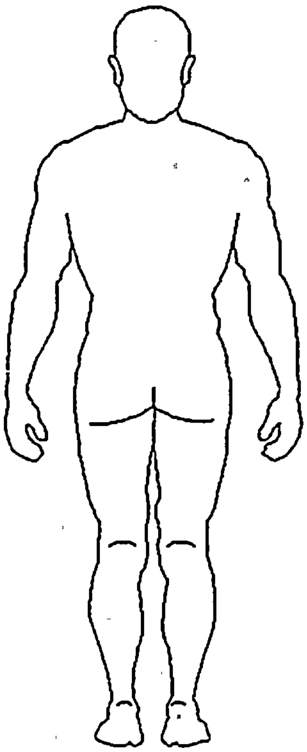
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*

Vehicle Impounded YES NO	*Item(s) Impounded:*

2.36 Form EP-0502, Individual Body Decontamination (sample)

FORM EP-0502A **PVNGS EMERGENCY PLANNING**

INDIVIDUAL BODY DECONTAMINATION



Monitor Name:	Date:	Time:
Patient Name:	Address:	
City. State:	ZIP:	Telephone:
CONTAMINATION		
Location on Clothing (describe):		
Location on Body (describe):		
Highest Contamination Levels Prior to Decontamination: ________	cpm mrem/hr	*(circle one)*
Highest Contamination Levels After Decontamination: ________	cpm mrem/hr	*(circle one)*
Item(s) Impounded:		

2.37 Form EP-0503, KI Distribution (sample)

FORM EP-0503 A **PVNGS EMERGENCY PLANNING**

KI DISTRIBUTION

Name:	SSN:	Work Group:
Reason For Dispensation:		

DISPENSATION DATA

Date:	Time:	Milligrams:

EC APPROVED *(circle one)*: Y N ______________________
(ADMINISTERING INDIVIDUAL SIGNATURE)

WORKER: I have reviewed the information below, I am aware of the potential health hazards involved with KI usage, and my usage hereunder is voluntary: ______________________
(SIGNATURE)

Potassium Iodide *(KI)*, a stable Iodine, may be used in the event of a radiological emergency as a blocking agent to prevent the uptake of radioactive iodine by the thyroid gland, which depends upon iodine for the synthesis of thyroid hormones. Iodine is normally supplied to the thyroid gland through dietary intake. However, the thyroid is capable of absorbing and storing only a limited amount of iodine. Excess amounts ingested are eliminated by urination. Therefore, the use of stable iodine will limit thyroid exposure by blocking the uptake of radioiodine by the thyroid, leading to elimination of radioactive iodine from the body.

The use of Potassium Iodide does present some risk to the user in the form of side effects, allergic reactions, or other contraindications. Allergic reactions leading to severe illness may occur for individuals with unusual sensitivity to iodine or those with pre-existing thyroid disease. Such reactions may include enlargement of the thyroid *(possibly leading to respiratory impairment)*, alterations in body metabolism due to increasing or decreasing thyroidal hormone output, and hypersensitive reactions such as fever, pain in joints, and alteration of blood cell counts. These effects are usually associated with iodine doses much higher and administered over a longer duration of time than those allowed to be administered by PVNGS Station procedures. Possible side effects include skin rash, swelling of the salivary glands, and iodism *(metallic taste, burning mouth and throat, sore teeth and gums, head cold symptoms, upset stomach, and possible diarrhea)*. Allergic reactions to low doses are usually limited to angioedema *(swelling or hives)*.

The above represents the extreme. The sensitivity of the average individual to Potassium Iodide at the levels administered is minimal. A good rule is that if no history exists for sensitivity to medication in general nor any for reactions to seafood or shellfish, then there should be no reaction to 130 mg of Potassium Iodide administered as one tablet once per day

Potassium Iodide may be taken along with other medications prescribed for thyroid problems *(e.g., thyroid hormone, antithyroid medications)*. Pregnant and nursing women, babies, and children may also take this drug. Additional questions may be clarified by reading Appendices B and C of EPA-400, available at Emergency Planning. Although the Food and Drug Administration has endorsed the use of Potassium Iodide, the risks associated with low dosages of Potassium Iodide for thyroid blocking in a radiation emergency may outweigh the risks associated with radioiodine induced thyroid nodules or cancer. For this reason, THE USE OF POTASSIUM IODIDE BY EMERGENCY WORKERS SHALL BE ON A VOLUNTARY BASIS

Potassium Iodide may only be authorized by the Emergency Coordinator for use by volunteers when the projected Thyroid CDE dose is 25 REM or greater. Emergency workers may be APS or non-APS employees at the facility. Under emergency conditions, volunteer approvals and briefings may be obtained or performed locally and telecommunicated to expedite the response. Follow-up monitoring of all individuals issued Potassium Iodide must be performed in cases where actual exposure to radioactive iodine did occur. This is necessary to maintain the thyroid blocking action by additional Potassium Iodide doses until the iodine activity decays. Follow-up monitoring of all individuals issued Potassium Iodide must also be performed in all cases for possible side effects from the Potassium Iodide.

FOLLOW-UP DATA

Was individual actually exposed to radioactive Iodine? Y N

If Y*(es)*, furnish additional information regarding subsequent KI administration, air sample data, Whole Body count data, and any other information appropriate to determination of actual Thyroid CDE:

Reviewed by: ______________________ Title: ______________________

2.38 Form EP-0511, Core Exit Thermocouple CDA, page 1 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

CORE EXIT THERMOCOUPLE CDA

DATE:	TIME:	UNIT:	CYCLE:

1) MAXIMUM CET TEMPERATURE

Date of temperature reading:	Maximum CET Temperature:
Time of temperature reading:	Reactor Vessel Pressure:

2) FUEL RODS RUPTURED (%)

Using the Reactor Vessel Pressure *(from above)* and the Maximum CET Temperature *(from above)*, determine the percent of fuel rods ruptured using Core Damage Assessment, Figure 1 *(attached)*.

Percent of Fuel Rods Ruptured *(from Figure 1)*: ___________

3) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Core Exit Thermocouple methodology yields damage estimates in Categories 1, 2, 3, and 4.

The result recorded above is likely a lower limit estimate.

The Noteworthy Items from 161G-0EP031, Core Damage Assessment, Section 1, Introduction, should be read and understood prior to making a determination.

Using the percent of fuel rods ruptured, the Clad Damage Characteristics from Core Damage Assessment, and engineering judgment, determine the USNRC Category of Fuel Damage.

USNRC Category of Fuel Damage: ___________

4) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

5) COMMENTS

2.39 Form EP-0511, Core Exit Thermocouple CDA, page 2 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

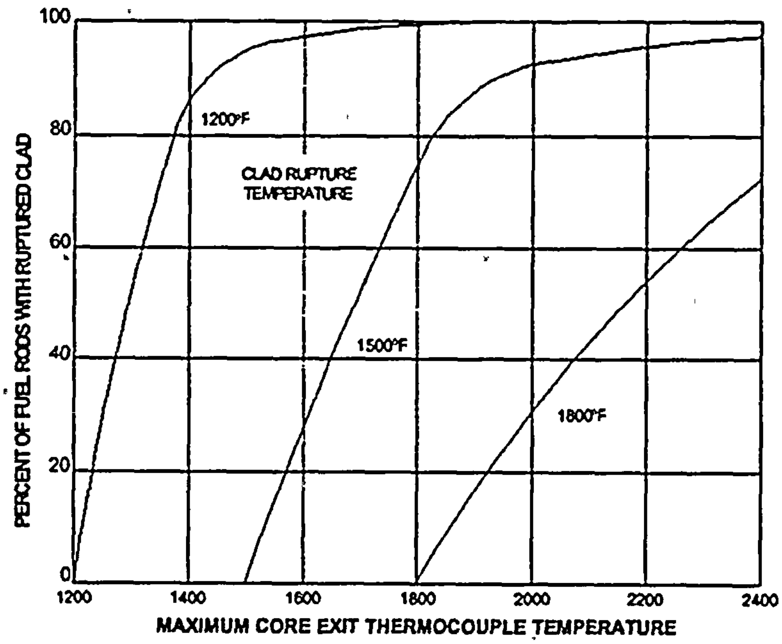
CORE EXIT THERMOCOUPLE CDA

NOTE

Figure taken from Core Damage Assessment, Figure 1

FIGURE 1

PERCENT OF FUEL RODS WITH RUPTURED CLAD vs MAXIMUM CORE EXIT THERMOCOUPLE TEMPERATURE



When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

2.40 Form EP-0512, Containment RMS CDA, page 1 of 3 (sample)

FORM EP-0512a **PVNGS EMERGENCY PLANNING**

CONTAINMENT RMS CDA (Part 1 of 2)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) PLANT POWER CORRECTION

If reactor power has not been steady over the 30 days prior to reactor shutdown, engineering judgment is required to determine the most representative power level to be used.

This judgment should consider the following guidelines:

- The average power during the 30 days is not necessarily the most representative value.
- The power levels at which the reactor last operated should weigh more heavily than earlier power levels.
- Continued operation at one power level should weigh more heavily than brief transient levels.
- In the case in which the reactor has produced power for less than 30 days, the estimate of core damage obtained could under-predict the actual conditions.

Record the prior 30-day power history:

POWER *(%)*	DURATION *(days)*

Using engineering judgment, determine the most representative power to be used in the power correction factor and record below:

Representative Power: ________ %

100 / Representative Power = Power Correction Factor *(PCF)*

100 / Representative Power = ________ *(PCF)*

3) DOSE RATE CORRECTION

Record the dose rates of each Containment radiation monitor and, using the Power Correction Factor *(PCF)* calculated in Step 2 *(above)*, calculate a corrected dose rate for each radiation monitor.

NOTES: RU Monitors read in REM / hour. In this case, REM / hour is equivalent to RAD / hour.
RU-148 and RU-149 are the Containment HI-Range monitors located at elevation 140' in Containment.

MONITOR ID	DATE / TIME	HRS SINCE SHUTDOWN	DOSE RATE *(RADS/HR)*	CORRECTED DOSE RATE *(DOSE RATE x PCF)*
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				

2.41 Form EP-0512, Containment RMS CDA, page 2 of 3 (sample)

FORM EP-0512B **PVNGS EMERGENCY PLANNING**

CONTAINMENT RMS CDA (Part 2 of 2)

DATE:	TIME:	UNIT:	CYCLE:

4) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Radiation Monitors methodology yields damage estimates in Categories 2 through 7 only.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using Core Damage Assessment, Figure 2 *(attached)*, the time since reactor shutdown, the corrected dose rates, engineering judgment, and the Dose Rate Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

MONITOR ID	USNRC CATEGORY OF FUEL DAMAGE
RU-148	
RU-149	

5) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

6) COMMENTS

2.42 Form EP-0512, Containment RMS CDA, page 3 of 3 (sample)

FORM EP-0512 B **PVNGS EMERGENCY PLANNING**

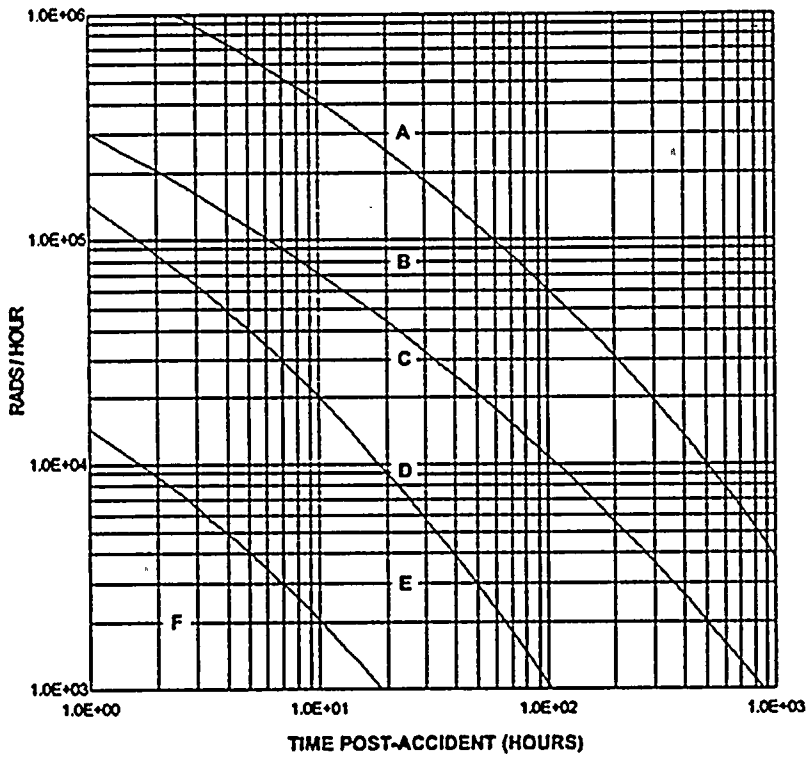
CONTAINMENT RMS CDA

NOTE

Figure taken from Core Damage Assessment, Figure 2

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL



A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

2.43 Form EP-0513, Containment Hydrogen CDA, page 1 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 1 of 5)

DATE:	TIME:	UNIT:	CYCLE:

NOTE: All figures referenced denote those contained in Core Damage Assessment, Figures.

1) CORE UNCOVERING ESTIMATES

INSTRUMENT	ESTIMATED CORE UNCOVERING TIME	ESTIMATED CORE RECOVERY TIME
Reactor Vessel Level Monitoring System	Lower Limit Elevation Uncovers Time: ________	Lower Limit Elevation Recovers Time: ________
Core Exit Thermocouple Temperature	Start of Continuous Rise or Exceed 660°F Time: ________ Temperature: ________	Rapid Temperature Drop to Saturation Time: ________ Temperature: ________
Core Exit Thermocouple Saturation Margin	Start of Superheat *(Use Figure 3)* Time: ________	Return to Saturation or Subcooling Time: ________

2) BEST ESTIMATE

Record the best estimate of core uncovering / recovery times and corresponding system pressure. The pressure recorded for core uncovering will be used in Step 10 in conjunction with Figure 8.

Core Uncovering: Time: ________ Pressure: ________

Core Recovery: Time: ________ Pressure: ________

3) INLET FLOW RATE

Record the approximate vessel inlet flow rates *(GPM)* during the core uncovering heatup period until the time of peak Core Exit Thermocouple *(CET)* temperature is reached.

HPSI Flow Rate: ________ LPSI Flow Rate: ________

Charging Flow Rate: ________ Other Inlet Flows: ________

4) SAMPLES

Obtain an RCS liquid sample and a Containment atmosphere sample *(online H_2 Monitor can be used)* in accordance with 74OP-xSS02 and record the values for the parameters listed below.

NOTE: At least 2 hours is expected between PASS sample request and sample results. It will not be possible to obtain many samples at the same time.

RCS Conditions	Containment Conditions
Sample: Date: ________ Time: ________	Sample: Date: ________ Time: ________
System Pressure: ________ psia	Containment Pressure: ________ psig
Temperature: ________ °F	Temperature: ________ °F
Reactor Vessel Level: ________ %	Hydrogen Concentration: ________ volume %
Pressurizer Level: ________ %	------------------------------------
Hydrogen Concentration: ________ cc/kg @ STP	------------------------------------

2.44 Form EP-0513, Containment Hydrogen CDA, page 2 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 2 of 5)

DATE:	TIME:	UNIT:	CYCLE:

5) HYDROGEN SAMPLE DATA REDUCTION

HYDROGEN MEASURED IN CONTAINMENT

$$\text{Containment Hydrogen}\left(\textit{total SCF}\right) = \frac{H_2}{100} \times 2.6E{+}06 \times \frac{(P_c + 14.7)}{14.7} \times \frac{492}{(T_c + 460)}$$

$$= \_\_\_\_ \times 2.6E{+}06 \times \_\_\_\_\_\_ \times \_\_\_\_\_\_ = \_\_\_\_\_\_ \text{ SCF}$$

Where,

H_2	=	Hydrogen concentration *(volume %)* as measured on Gas Chromatograph *(from Step 4 or H_2 Monitor)*
100	=	Conversion from percent to decimal fraction
2.6E+06	=	Containment volume in cubic feet
P_c	=	Containment pressure in psig *(from Step 4)*
T_c	=	Containment temperature in °F *(from Step 4)*
460	=	Conversion from °F to °R
492	=	Standard temperature in °R
14.7	=	Standard pressure in psia
SCF	=	Standard Cubic Feet

HYDROGEN MEASURED IN RCS

$$\text{RCS Hydrogen}\left(\textit{total SCF}\right) = [H_2] \times V_{RCS} \times DCF \times 3.531E{-}05 \times 1.0E{-}03$$

$$= \_\_\_\_ \times \_\_\_\_ \times \_\_\_\_ \times 3.531E{-}05 \times 1.0E{-}03 = \_\_\_\_ \ ft^3$$

Where:

H_2	=	Hydrogen concentration in cc/kg @ STP *(from Step 4)*
V_{RCS}	=	RCS volume in cc *(from Figure 4)*
DCF	=	Density Correction Factor in g/cc *(from Figure 5)*
3.531E-05	=	Conversion factor *(ft^3/cc)*
1.0E-03	=	Conversion factor *(kg/g)*

TOTAL MEASURED HYDROGEN

Containment Hydrogen + RCS Hydrogen = Total Hydrogen *(SCF)* = ________ SCF

2.45 Form EP-0513, Containment Hydrogen CDA, page 3 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 3 of 5)

DATE:	TIME:	UNIT:	CYCLE:

6) HYDROGEN CORRECTION FOR OXIDATION

The total measured Hydrogen calculated in Step 5 includes Hydrogen generated from the oxidation of materials within Containment, as well as Hydrogen generated from the radiolysis of water. The Hydrogen produced from these two processes will be calculated in Steps 6 and 7 and subtracted from the total Hydrogen calculated in Step 5.

Record the Containment temperature at selected time intervals *(up until the time the Containment sample was obtained)* and calculate the Hydrogen generated by oxidation of materials within Containment using Figure 6.

NOTE: An attempt should be made to select the time intervals such that the change in Containment temperature is not greater than 20°F.

Time at Start of Interval	Interval Duration (hours)	Average Containment Temperature During Interval (°F)	H_2 Production Rate *(SCF/hr)* from Figure 6	H_2 Produced *(SCF)* = Interval X Production Rate
Accident Start	--------------	--------------	--------------	--------------

Total Hydrogen Production *(SCF)* ✱ = __________ SCF

✱ The maximum value for PVNGS is 200,271 SCF. If a higher value is obtained from the calculation, enter 200,271 SCF in the space provided.

2.46 Form EP-0513, Containment Hydrogen CDA, page 4 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 4 of 5)

DATE:	TIME:	UNIT:	CYCLE:

7) HYDROGEN CORRECTION FOR RADIOLYSIS

Determine the amount of Hydrogen produced from the radiolysis of water using the following power, decay times, and Figure 7:

Reactor Power at Time of Shutdown *(for constant power conditions)*: __________

Representative Power *(RP)* - *(from Form EP-0512, Step 2)*: __________

Estimated MWT = Full Power MWT X RP = 3800 X __________ = __________ MWT

Reactor Shutdown Date: __________ Reactor Shutdown Time: __________

Sample Date: __________ Sample Time: __________

Time from Shutdown to Sample: __________ hours

Using Figure 7, determine the specific Hydrogen production rate *(SCF/MWT)* by radiolysis for the sample time. Obtain a value from each curve, multiply by the estimated MWT, and record total H_2 produced by radiolysis.

Limit Curve	H_2 Produced *(SCF/MWT)*		Operating Power *(MWT)*		Total H_2 produced *(SCF)*
UPPER:	__________	X	__________	=	__________
LOWER:	__________	X	__________	=	__________

Once obtained, use the results of the radiochemistry damage assessment *(Form EP-0514)* to estimate which results should be used: the Upper Limit for major fuel pellet overheat, the Lower Limit for initial fuel pellet overheat, or the appropriate estimate between the two curves for intermediate fuel overheat.

8) TOTAL HYDROGEN PRODUCED FROM CORE CLAD

Total H_2 Measured *(from Total Measured Hydrogen in Step 5)*: __________ SCF

H_2 Production from Containment Materials *(from Step 6)*: __________ SCF

H_2 Production from Radiolysis *(from Step 7)*: __________ SCF

Total H_2 from Core Clad Oxidation = *(Step 5 - [Step 6 + Step 7])* = __________ SCF

9) PERCENT OF CLAD OXIDIZED

$$\text{\% Clad Oxidized} = \frac{\text{Total } H_2 \text{ from Clad Oxidation}}{5.65E{+}03 \text{ SCF}} = \frac{\_\_\_\_\_\_\_\_}{5.65E{+}03} = \_\_\_\_\_\_\_\_ \%$$

2.47 Form EP-0513, Containment Hydrogen CDA, page 5 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 5 of 5)

DATE:	TIME:	UNIT:	CYCLE:

10) PERCENT OF RUPTURED FUEL RODS

Using the percent of clad oxidized *(Step 9)*, the pressure during core uncovering *(Step 2)*, and Figure 8, determine the percent of ruptured fuel rods.

Estimated % Ruptured Fuel Rods *(from Figure 8)*: ________ %

11) PERCENT OF EMBRITTLED FUEL RODS

Using the percent of clad oxidized *(Step 9)* and Figure 9, determine the percent of embrittled fuel rods.

Estimated % Embrittled Fuel Rods *(from Figure 9)*:

RANGE: Upper: ________ % Lower: ________ %

12) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Hydrogen methodology yields damage estimates in Categories 3, 4, 5, 6, or 7.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using the estimates of the percent of fuel rods ruptured, the percent of fuel rods embrittled *(damaged)*, and the Clad Damage Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

USNRC Category*(ies)* of Fuel Damage: ________

13) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

14) COMMENTS

____
____
____
____
____
____
____

2.48 Form EP-0514, Containment Radiochemistry CDA, page 1 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 1 of 11)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) SAMPLE LOCATIONS

<u>NOTE</u>: During certain small break LOCA events, it will not be possible for PASS to obtain a sample representative of the Containment sump until after a RAS occurs. This could be 14+ hours after the accident. Refer to Core Damage Assessment, Introduction, Noteworthy Items, for guidance without a Containment sump sample.

Determine the most appropriate sample locations for assessment using Figure 10 in Core Damage Assessment.

3) SAMPLING

Obtain radiochemistry samples and sample results from the appropriate sample locations as determined in Step 2, above.

4) SAMPLE DATA

Record the following data at the time each sample was obtained:

	REACTOR COOLANT SYSTEM	CONTAINMENT ATMOSPHERE	CONTAINMENT SUMP
Sample Date			
Sample Time			
Sample Number			
Pressure *(psig)*	--------------		--------------
Temperature *(°F)*			--------------
RCS Level *(RVLMS)* at Sample Time *(%)*		--------------	--------------
Containment Volume *(cc)*	--------------	7.36E+10	--------------
Containment Water Level *(6-150 inches)*	--------------	--------------	

2.49 Form EP-0514, Containment Radiochemistry CDA, page 2 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 2 of 11)

DATE:	TIME:	UNIT:	CYCLE:

5) RCS VOLUME

Determine the RCS volume at the time of the sample using RVLMS and Figure 4 in Core Damage Assessment, or by using ERFDADS Point ID #SPDS0260.

___ HJTC Uncovered = ___________ cc *(if using Figure 4 and RVLMS)*

SPDS0260 = ___________ gallons X 3.785412E+03 = ___________ cc *(if using SPDS0260)*

6) CONTAINMENT WATER VOLUME

NOTE: If Containment water level is not available, Containment water volume must be estimated from RWT, RCS, and SIT volumetric contributions.

Determine the Containment water volume at the time of the sample using Containment water level *(from Step 4)* and Figure 11 in Core Damage Assessment.

Containment Volume = ___________ cc

2.50 Form EP-0514, Containment Radiochemistry CDA, page 3 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 3 of 11)

DATE:	TIME:	UNIT:	CYCLE:

7) RCS SAMPLE ACTIVITY CORRECTION

Record the activity of the RCS sample and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

RCS Activity = Decay Corrected Activity *(from above)* X ρ X RCS_{VOL} X 1.0E-06

Where:

ρ = Water density correction factor *(see Figure 5 of Core Damage Assessment)*
RCS_{VOL} = RCS water volume *(from Step 5)*
1.0E-06 = Conversion from µCi to Ci

Record ρ and t: ρ = ____________ t = ____________

Date of Reactor Shutdown:	____________	Date of RCS Sample:	____________
Time of Reactor Shutdown:	____________	Time of RCS Sample:	____________

TABLE 1: RCS SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*RCS Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.51 Form EP-0514, Containment Radiochemistry CDA, page 4 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 4 of 11)

DATE:	TIME:	UNIT:	CYCLE:

8) CONTAINMENT SUMP SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Sump sample if obtained and correct the activity for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

Containment Sump Activity = Decay Corrected Activity *(from above)* X Containment Sump Volume X 1.0E-06

Where:

Containment Sump Volume = Containment Sump Volume *(from Step 6)*
1.0E-06 = Conversion from µCi to Ci

Record t: t = ____________

Date of Reactor Shutdown:	____________	Date of Contain. Sump Sample:	____________
Time of Reactor Shutdown.	____________	Time of Contain. Sump Sample:	____________

TABLE 2: CONTAINMENT SUMP SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*Containment Sump Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.52 Form EP-0514, Containment Radiochemistry CDA, page 5 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 5 of 11)

DATE:	TIME:	UNIT:	CYCLE:

9) CONTAINMENT ATMOSPHERE SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Atmosphere sample if obtained and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*

t = Time since reactor shutdown *(seconds)* at time of sample

Containment Atmosphere Activity = Decay Corrected Activity *(from above)* X $[(P_1 + 14.7) / 14.7]$ X $[492 / (T_1 + 460)]$ X (7.36E+10) X 1.0E-06

Where:

P_1 = Containment pressure at time of sample *(psig)*

T_1 = Containment temperature at time of sample *(°F)*

7.36E+10 = Containment atmosphere volume *(cc)*

1.0E-06 = Conversion from µCi to Ci

Record t, P_1, and T_1. t = ________ P_1 = ________ psig T_1 = ________ °F

Date of Reactor Shutdown: ____________ Date of Contain. Atmos. Sample: ____________

Time of Reactor Shutdown: ____________ Time of Contain. Atmos. Sample: ____________

TABLE 3: CONTAINMENT ATMOSPHERE SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Specific Sample Activity (µCi/cc)*	*Decay Corrected Specific Activity (µCi/cc)*	*Containment Atmosphere Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{86}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.53 Form EP-0514, Containment Radiochemistry CDA, page 6 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 6 of 11)

DATE:	TIME:	UNIT:	CYCLE:

10) IODINE / NOBLE GAS RATIOS

Calculate the following ratios for each Noble Gas and Iodine isotope using the decay corrected specific activities obtained in Steps 7, 8, and 9:

Noble Gas Ratio = Noble Gas Isotope Activity / Xenon ^{133} Activity

Iodine Ratio = Iodine Isotope Activity / Iodine ^{131} Activity

Isotope	*RCS Activity (Ci)*	*RCS Ratio*	*Containment Sump Activity (Ci)*	*Containment Sump Ratio*	*Containment Atmosphere Activity (Ci)*	*Containment Atmosphere Ratio*
Kr^{87}						
Xe^{131m}						
Xe^{133}		1.0		1.0		1.0
I^{131}		1.0		1.0		1.0
I^{132}						
I^{133}						
I^{135}						

11) SOURCE OF RELEASE

Determine the source of release by comparing the ratios calculated in Step 10 *(above)* to the predicted ratios provided below:

Isotope	*Activity Ratio in Fuel Pellet Inventory*	*Activity Ratio in Gap Inventory*
Kr^{87}	0.200	< 0.001
Xe^{131m}	0.003	0.001 - 0.003
I^{132}	1.400	0.010 - 0.050
I^{133}	2.000	0.500 - 1.000
I^{135}	1.800	0.100 - 0.500

<u>NOTE</u>: Within the accuracy of included calculations, it is appropriate to select as a source that ratio which is closest to the value obtained in Step 10.

Source of Release: ____________________

2.54 Form EP-0514, Containment Radiochemistry CDA, page 7 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 7 of 11)

DATE:	TIME:	UNIT:	CYCLE:

12) SOURCE INVENTORY

Each isotope has an equilibrium inventory. However, these equilibrium source inventories must be corrected for the plant power history if the reactor has not been operating continually at 100% power.

The isotopes are divided into 2 groups based on their respective half-lives. Group 1 isotopes are to be used if reactor power has not changed by greater than ± 10% in the last 30 days prior to the accident. Group 2 isotopes are used if reactor power has not changed by greater than ± 10% in the last 4 days prior to the accident.

The following equations can be used to determine the Power Correction Factor *(PCF)* for the respective isotopic group if the previously mentioned criteria is satisfied.

Group 1 PCF = Steady State Power Level for the prior 30 Days / 100

Group 2 PCF = Steady State Power Level for the prior 4 Days / 100

If the reactor has not operated at a constant power level prior to shutdown, the following equation is used *(use a 30-day power history)*:

<u>NOTE</u>: Use only the prior 30-day power history for the equation below.

$$PCF = {}_j P_j (1 - e^{-t_j}) e^{-t_j}$$

Where,

P_j = Fraction of rated reactor power in period$_j$

t_j = Duration of period$_j$

t_j = Time from the end of period$_j$ to reactor shutdown *(seconds)*

= Decay constant *(seconds^{-1})*

continues...

2.55 Form EP-0514, Containment Radiochemistry CDA, page 8 of 11 (sample)

FORM EP-0514A PVNGS EMERGENCY PLANNING

CONTAINMENT RADIOCHEMISTRY CDA (Part 8 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***12) SOURCE INVENTORY** continued...*

Using the appropriate equation, calculate the Power Correction Factor for each isotope and the corrected source inventory. Record the results in the tables below.

NOTE: The Equilibrium Source Inventories listed below are the maximum peak inventories for a reactor core operating with 5% enriched U^{235} at 3990 MWT. The actual core inventory will most likely be slightly lower than the inventories given.

GAS GAP INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		1.54E+01	
Xe^{131m}	1	6.7E-07		1.09E+05	
Xe^{133}	1	1.5E-06		1.91E+07	
I^{131}	1	9.9E-07		9.84E+06	
I^{132}	2	8.4E-05		1.14E+04	
I^{133}	2	9.3E-06		1.06E+07	
I^{135}	2	2.9E-05		1.76E+06	

FUEL PELLET INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		7.57E+07	
Xe^{131m}	1	6.7E-07		1.20E+06	
Xe^{133}	1	1.5E-06		2.12E+08	
I^{131}	1	9.9E-07		1.07E+08	
I^{132}	2	8.4E-05		1.55E+08	
I^{133}	2	9.3E-06		2.23E+08	
I^{135}	2	2.9E-05		2.09E+08	
Cs^{134}	1	1.1E-08	1.00	2.22E+07	
Rb^{86}	2	6.5E-04		1.08E+08	
Te^{129}	2	1.7E-04		3.34E+07	
Te^{132}	1	2.5E-06		1.52E+08	
Sr^{89}	1	1.6E-07		1.32E+08	
Ba^{140}	1	6.3E-07		1.98E+08	
La^{140}	1	4.8E-06		2.11E+08	
La^{142}	2	1.2E-04		1.87E+08	
Pr^{144}	2	6.7E-04		1.67E+08	

2.56 Form EP-0514, Containment Radiochemistry CDA, page 9 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 9 of 11)

DATE:	TIME:	UNIT:	CYCLE:

13) INVENTORY PERCENT

Calculate the percent of the corrected source inventory present for each isotope and record the results in the tables below.

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF GAS GAP INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			

continues...

2.57 Form EP-0514, Containment Radiochemistry CDA, page 10 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 10 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***13) INVENTORY PERCENT** continued...*

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF FUEL PELLET INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			
Cs^{134}			
Rb^{88}			
Te^{129}			
Te^{132}			
Sr^{89}			
Ba^{140}			
La^{140}			
La^{142}			
Pr^{144}			

2.58 Form EP-0514, Containment Radiochemistry CDA, page 11 of 11 (sample)

FORM EP-0514 A PVNGS EMERGENCY PLANNING

CONTAINMENT RADIOCHEMISTRY CDA (Part 11 of 11)

DATE:	TIME:	UNIT:	CYCLE:

14) USNRC CATEGORY OF FUEL DAMAGE

NOTES: Engineering judgment is used to compare the previous parameters with the 10 USNRC Categories of Fuel Damage in Core Damage Assessment, Fuel Damage Categories. Core damage is not anticipated to occur uniformly. It is anticipated that the included calculations will yield a combination of 1 or more categories which exist simultaneously.

Samples are likely to have been collected at different times

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Determine the USNRC Category of Fuel Damage using the Radiological Characteristics from Core Damage Assessment, and the following criteria:

1. Identification of the isotopes which most characterize a given sample *(see Steps 7, 8, and 9)*.
2. Identification of the source of the release *(see Step 11)*.
3. Percent of source inventory for each isotope present *(see Step 13)*.

USNRC Category*(ies)* of Fuel Damage: __________

15) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

16) COMMENTS

____
____
____
____
____
____
____
____
____
____
____
____

PV216-06N1 (8-88)

2.59 Form EP-0541, Palo Verde NAN Emergency Message (sample)

FORM EP-0541 c

PVNGS EMERGENCY PLANNING

PALO VERDE NAN EMERGENCY MESSAGE FORM

1 *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

2 This NAN call was initiated at: ________ *(time)*

3 This is Palo Verde Nuclear Generating Station Notification of

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY
ALERT GENERAL EMERGENCY

declared in Unit ____ at ________ *(time)* on ________ *(date)*

PVNGS Emergency Status Code*(s)* ________

4 The wind speed is ________ *(35' elev - 15 min avg)* MPH from ________ *(35' elev - 15 min avg)* Degrees

Authenticator Code: ________

This is ________ *(name)*: STSC Comm Gov't Liaison *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF *(Circle ERO facility)*

5 THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ________
- ☐ Other ________

6 *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

________ *(EC / EOD Signature)*

________ *(Date)* *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-256-1011			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-223-2000			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-255-4845			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-244-0504			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-273-1411			
USNRC Headquarters *(STA will call)*	301-816-5100	301-951-0550			
7 GROUP PAGER: *(Read Message)*: "This Is / Is not a drill. This is PVNGS Unit ___ Classification ________ Please respond appropriately." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager 1611)*	Normal phone *(pager 7600-1611)*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager 1677)*	Normal phone *(pager 7600-1677)*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager 1633)*	Normal phone *(pager 7600-1633)*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	81-1080, 81-1081, or 9-602-250-1070			

F_EP0541.DOC 09/09/99 09:25:21

2.60 Form EP-0542, Followup Emergency Message, page 1 of 2 (sample)

FORM EP-0542A PVNGS EMERGENCY PLANNING

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 1 of 2)*

1 *(check one)* ☐ - THIS IS A DRILL ☐ - THIS IS NOT A DRILL

Message Number: ______________ *(ARRA use only)*

THIS IS A PALO VERDE NUCLEAR GENERATING STATION FOLLOW-UP INFORMATION MESSAGE CONCERNING THE *(circle one)*
UNUSUAL EVENT - ALERT - SITE AREA EMERGENCY - GENERAL EMERGENCY declared in Unit ____ at ________ *(time)* MST on ________ *(date)*

PVNGS EMERGENCY STATUS CODE*(S)* for Emergency stated above ________

2 THIS IS ______________ *(name)* ______________ *(ERO title)* at ______________ *(facility)*

3 EMERGENCY stated above was *(check one)*

- ☐ - UPGRADED to ________ at ________ MST on ________
- ☐ - CONTINUES
- ☐ - DOWNGRADED to ________ at ________ MST on ________
- ☐ - TERMINATED at ________ MST on ________

4 PROTECTIVE ACTION RECOMMENDATION*(S)* *(check appropriately)*

- ☐ - NONE
- ☐ - NO CHANGE SINCE LAST PAR
- ☐ - EVACUATE ________
- ☐ - SHELTER ________
- ☐ - OTHER ________

If the Emergency was terminated, go to Item 14 after completing Items 1-4 (otherwise, continue to Item 5).
If Items 5-13 have not changed from previous Follow-up transmission, write "NC" by those that apply.

5 EMERGENCY DESCRIPTION / REMARKS

____
____
____
____

6 PVNGS FIELD ACTIVITIES

- ☐ - RFAT dispatched
- ☐ - Site Evacuation

7 REACTOR STATUS *(check one)*

- ☐ - Tripped at ________ MST on ________
- ☐ - Critical at ____ % thermal power
- ☐ - Shutdown in progress

2.61 Form EP-0542, Followup Emergency Message, page 2 of 2 (sample)

FORM EP-0542A **PVNGS EMERGENCY PLANNING**

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 2 of 2)*

Message Number: ____________________
(ARRA use only)

8 GASEOUS RELEASES *(check one)*

- ☐ - Within Technical Specifications
- ☐ - Were above Technical Specifications
- ☐ - Above Technical Specifications
- ☐ - Potentially above Technical Specifications

Point of Release ____________ Estimated Duration ____________ Started at ________ MST on ________

Last Significant Change at ________ MST on ________ Release stopped at ________ MST on ________

Iodines ________ μCi/sec Noble Gases ________ μCi/sec Iodine / Noble Gas ________ *(ARRA use only)*

Effluent flow rate ______ cfm x 472 = ________________ cc/sec *(ARRA use only)*

9 METEOROLOGICAL DATA

Wind is from ________ Degrees at ________ MPH Stability Class ________ Precipitation *(circle one)* YES NO
(35' elev - 15-min avg) *(35" elev - 15-min avg)*

10 PLUME ARRIVAL TIME AT *(enter time or "N/A" if not applicable)*

Ruth Fisher School ________ MST Arlington School ________ MST

11 THE FOLLOWING ACTIONS ARE UNDERWAY ____________________

12 WE REQUEST THE FOLLOWING ONSITE SUPPORT / ASSISTANCE FROM OFFSITE SOURCES

____

13 OUR PROGNOSIS IS that conditions

- ☐ - Are under control
- ☐ - Can be expected to terminate within ______ hours
- ☐ - Are worsening

14 *(check one)*

- ☐ - THIS IS A DRILL
- ☐ - THIS IS NOT A DRILL

APPROVAL:

____
Emergency Coordinator (EC)
-- or --
Emergency Operations Director (EOD)

____
Date *Time*

PV216-08NI (6-88)

2.62 Form EP-0543, Emergency Termination Message (sample)

FORM EP-0543 D **PVNGS EMERGENCY PLANNING**

EMERGENCY TERMINATION MESSAGE FORM

1 *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

2 This NAN call was initiated at: ______________ *(time)*

3 This is Palo Verde Nuclear Generating Station. The...

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY

ALERT GENERAL EMERGENCY

declared in Unit ____ at ________ *(time)* on ________ *(date)*

has been terminated at ________ *(time)* on ________ *(date)*

4 The wind speed is ________ *(35' elev - 15 min avg)* MPH from ________ *(35' elev - 15 min avg)* Degrees

Authenticator Code: ______________

This is ______________ *(name)*: STSC Comm Gov't Liaison *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF *(Circle ERO facility)*

5 THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ________
- ☐ Other ________

6 *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

______________ *(EC / EOD Signature)*

______________ *(Date)* *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-256-1011			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-223-2000			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-255-4845			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-244-0504			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-273-1411			
USNRC Headquarters *(STA will call)*	301-816-5100	301-951-0550			

7 GROUP PAGER: *(Read Message)*: "This is / is not a drill. This is PVNGS - the event has been terminated." *(repeat message once)*

Group Paging System #1 *(read message above)*	EMER #1 *(pager 1611)*	Normal phone *(pager 7600-1611)*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager 1677)*	Normal phone *(pager 7600-1677)*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager 1633)*	Normal phone *(pager 7600-1633)*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	81-1080, 81-1081, or 9-602-250-1070			

2.63 Form EP-0560, Site Security Status (sample)

FORM EP-0560A PVNGS EMERGENCY PLANNING

SITE SECURITY STATUS

Name:		Date:	Time:
ACCESS CONTROL			
Site		**Protected Area**	
Vehicle Traffic:		Personnel Traffic:	
Areas to Avoid:		Areas to Avoid:	
IMPACTS TO SECURITY			

OFFSITE ASSISTANCE		
Notified	**E T A**	**Onsite**

TECHNICAL SUPPORT CENTER SECURITY
MISCELLANEOUS
Suspension of Safeguards:
Unaccounted Individuals:
Transportation:
Security Personnel Status:

2.64 Form EP-0561, Individual Accountability (sample)

FORM EP-0561 B **PVNGS EMERGENCY PLANNING**

INDIVIDUAL ACCOUNTABILITY

Assembly Area:		Date:	Time:
Department / Group:			Unit:
NAME	***ACAD NUMBER***	***NAME***	***ACAD NUMBER***

NOTE Contact Security Supervision or FAX this completed form with Accountability results for this Assembly Area to the CAS

2.65 Form EP-0570, RMS Overview, page 1 of 3 (sample)

FORM EP-0570 A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 1 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-01	CH-1	Particulate	µCi / cc	Containment airborne - Isolates on SIAS / CIAS - Required for leak detection - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
	CH-3	Noble Gas	µCi / cc	Required for leak detection - Indicates actual concentration
RU-02	CH-1	Liquid	µCi / ml	Train-A Essential Cooling Water monitor
RU-03	CH-1	Liquid	µCi / ml	Train-B Essential Cooling Water monitor
RU-04	CH-1	Liquid	µCi / ml	S/G-1 blowdown monitor
RU-05	CH-1	Liquid	µCi / ml	S/G-2 blowdown monitor
RU-06	CH-1	Liquid	µCi / ml	Nuclear Cooling Water monitor
RU-07	CH-1	Liquid	µCi / ml	Auxiliary Steam Condensate monitor - HI Alarm diverts condensate to radwaste storage
RU-08	CH-1	Particulate	µCi / cc	Auxiliary Building airborne - Located downstream of RU-09 and RU-10 - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
RU-09	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 100' elevation and below
RU-10	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 120' elevation and above
RU-12	CH-1	Noble Gas	µCi / cc	Waste Gas Decay Tank release monitor - HI Alarm isolates WGDT release
RU-14	CH-1	Particulate	µCi / cc	Radwaste Building Exhaust - Indicates rate-of-change in accumulated activity
RU-15	CH-1	Noble Gas	µCi / cc	Radwaste Building Exhaust
RU-16	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation personnel hatch
RU-17	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation seal table area - Disconnected under power operation
RU-18	CH-1	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-19	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation - monitors new fuel racks
RU-20	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-21	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-22	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-23	CH-1	Radiation	mrem / hr	Chemistry Laboratory 140' elevation general area
RU-24	CH-1	Radiation	mrem / hr	Central Calibration Facility north of Unit 1
RU-25	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation controlled machine shop
RU-26	CH-1	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area
RU-29	CH-1	Noble Gas	µCi / cc	Train-A Control Room Ventilation Intake monitor - HI Alarm initiates CREFAS
RU-30	CH-1	Noble Gas	µCi / cc	Train-B Control Room Ventilation Intake monitor - HI Alarm initiates CREFAS
RU-31	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation Fuel Pool general area - HI Alarm initiates Train-A FBEVAS which cross-trips CREFAS
RU-33	CH-1	Radiation	mrem / hr	Containment 140' elevation refueling machine general area - Disconnected under power operation
RU-34	CH-1	Noble Gas	µCi / cc	Containment Purge release monitor
RU-37	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-A CPIAS which cross-trips CREFAS
RU-38	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-B CPIAS which cross-trips CREFAS

2.66 Form EP-0570, RMS Overview, page 2 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 2 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-5x (51 / 52 / 53)	CH-1	Particulate	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
	CH-2	Iodine	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
	CH-3	Noble Gas	µCi / cc	Not normally used
RU-61	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 1 Plant Vent stack
RU-62	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 2 Plant Vent stack
RU-63	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 3 Plant Vent stack
RU-139	CH-1	Radiation	mrem / hr	S/G-1 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-1 Main Steam Line-2 monitor
RU-140	CH-1	Radiation	mrem / hr	S/G-2 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-2 Main Steam Line-2 monitor
RU-141	CH-1	Noble Gas	µCi / cc	Condenser Vacuum Exhaust monitor - HI Alarm lines up condenser exhaust in Thru-Filter Mode
RU-142	CH-1	N^{16}	cpm	S/G-1 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-2	N^{16}	cpm	S/G-1 Main Steam Line-2 monitor for S/G tube leakage at power
	CH-3	N^{16}	cpm	S/G-2 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-4	N^{16}	cpm	S/G-2 Main Steam Line-2 monitor for S/G tube leakage at power
RU-143	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent LO-Range monitor - actual concentration
	CH-2	Particulate	µCi / cc	Auxiliary Building Vent LO-Range monitor - indicates gross activity only
	CH-3	Iodine	µCi / cc	
RU-144	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Auxiliary Building Vent HI-Range monitor
	CH-3	Rel Humidity	% RH	
	CH-4			Non-existent - Used as filter collection chambers
	CH-5			
RU-145	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust monitor - HI Alarm initiates Train-B FBEVAS which cross-trips CREFAS
RU-146	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Fuel Building Exhaust HI-Range monitor
	CH-3			Non-existent - Used as filter collection chambers
	CH-4			
	CH-5			
RU-148	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation seal table area
RU-149	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation personnel hatch
RU-150	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-A monitor at 80' elevation
RU-151	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-B monitor at 80' elevation
RU-152	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 70' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 70' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west end 40' elevation near RDT Pumps
	CH-4	Radiation	mrem / hr	Auxiliary Building center wall 51' elevation at Containment
RU-153	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 100' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Charging Pumps
	CH-3	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Penetration Room

2.67 Form EP-0570, RMS Overview, page 3 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 3 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-154	CH-1	Radiation	mrem / hr	Auxiliary Building west end 120' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east end 120' elevation by RU-10 monitor
	CH-3	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-155	CH-1	Radiation	mrem / hr	MSSS 86' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 86' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 88' elevation
	CH-4	Radiation	mrem / hr	Auxiliary Building 120' elevation *(Letdown monitor)*
RU-156	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 70' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
RU-157	CH-1	Radiation	mrem / hr	MSSS 100' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 100' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 120' elevation
RU-158	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 120' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building 140' elevation at Containment personnel hatch
	CH-3	Radiation	mrem / hr	Auxiliary Building east penetration 140' elevation by purge lines
	CH-4	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area

2.68 Form EP-0620, Technical Analysis Overview (sample)

FORM EP-0620A **PVNGS EMERGENCY PLANNING**

TECHNICAL ANALYSIS OVERVIEW

DATE:		TIME:
CRITICAL SAFETY FUNCTION STATUS		
Reactivity Control:		
Inventory Control:		
Pressure Control:		
Heat Removal:		
Maintenance of Vital AC:		
Maintenance of Vital DC:		
Containment Isolation:		
Containment Combustible Gas Control:		
Containment Temperature / Pressure Control:		
LOST SAFETY FUNCTION		
Time to boil:		
Time to uncover core:		
Time to core melt:		
Time to Rx vessel failure:		
Time to Containment failure:		
Time to reach 65 psig Containment:		
DOSE PROJECTIONS *(SA)* - HIGH SIDE		**RECOMMENDATION TO REDUCE OFFSITE DOSE CONSEQUENCES**
2 -Hour EAB *(Thyroid CDE)*:	REM	
2 -Hour EAB *(TEDE)*:	REM	
__-Hour EAB *(Thyroid CDE)*:	REM	
__-Hour EAB *(TEDE)*:	REM	
__-Hour LPZ *(Thyroid CDE)*:	REM	
__-Hour LPZ *(TEDE)*:	REM	
RECOMMENDED OPERATOR ACTION*(S)*		
OTHER INFORMATION		

2.69 Form EP-0630, Engineering Summary (sample)

FORM EP-0630A PVNGS EMERGENCY PLANNING

ENGINEERING SUMMARY

DATE:	TIME:
CRITICAL SAFETY FUNCTION STATUS	
Reactivity Control:	Inventory Control:
Pressure Control:	Heat Removal:
Maintenance of Vital AC:	Maintenance of Vital DC:
CTMT Isolation:	CTMT Combustible Gas Control:
CTMT Temperature / Pressure Control:	
LOST SAFETY FUNCTION	
Time to boil:	*Time to uncover core:*
Time to core melt:	*Time to Rx vessel failure:*
Time to CTMT failure:	*Time to reach 65 psig CTMT:*

EQUIPMENT OUT OF SERVICE	*FAILURE MODE*	*ESTIMATED RECOVERY TIME*

SYSTEMS STATUS
Heat Sink Systems:
Chemistry:
Electrical:
Mechanical:
Reactor Engineering:
Safety / Risk Assessment:

RESOURCE RECOMMENDATION*(S)*	
Equipment	Personnel

CONTINGENCIES

OTHER INFORMATION

Appendix D - Notification

1.0 Initial notifications

1.1 Noteworthy Items for notifications

1.1.1 The numbers on the colored Authenticator Code envelopes represent the sequence of actual events that have taken place on site during the current calendar year. They do not represent the month of the year. The white Authenticator Code envelopes are used for drills, exercises, and tests only. Use the same Authenticator Code for the entire event. However, if the event terminates after offsite agencies have been notified and then another event takes place, retrieve the next lowest-numbered colored Authenticator Code envelope.

1.1.2 If the event has been terminated prior to commencing notifications, the Emergency Termination Message Form should be used in place of the Palo Verde NAN Emergency Message Form. If the event or Protective Action Recommendation changes during notifications, inform the current contact that the event has changed and discontinue calling the remaining people on the call-out list.

1.1.3 Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, meteorological information required on any of the forms should be entered as "N/A". Ensure that the Emergency Coordinator / Emergency Operations Director is informed and that someone is sent to the Meteorological Tower for the necessary data to provide to the offsite agencies at a later time.

1.1.4 While making upgraded, downgraded, and/or termination notifications, complete the "Date / Time / Initials" columns for those agencies contacted. Certain agencies may not respond on backshifts or weekends. The individual notifying USNRC Headquarters will complete the "USNRC Headquarters" Section of the form.

1.1.5 If contact with the required agencies is not made via the NAN ringdown phones, either the NAN Radio Backup (PVNGS radio), the regular phone, or the cellular telephone must be used. The designated backup for the NAN is the PVNGS radio.

1.1.6 The Group Pager message that is read to Emergency Response Organization personnel should include the emergency classification by name, e.g., Unusual Event, Alert, etc.

1.1.7 All noteworthy items and problems should be recorded on the Action Logsheets.

1.2 Authenticator Codes

1.2.1 For initial notification of the current event, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope. Do not complete step 2 of the form at this time.

1.3 Completing the Emergency Message Form

1.3.1 Complete Steps 1, 4, and 6 of Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

1.3.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

1.4 Checking whether NAN is operational

1.4.1 If the NAN is operational, notify offsite agencies using step 1.5. If the NAN is not operational, notify offsite agencies using step 1.6.

1.5 Offsite notifications using the NAN

1.5.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

1.5.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.5.3 Repeat message once.

1.5.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.5.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.5.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

1.5.7 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.5.8 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

1.5.9 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.5.10 Go to step 1.7 to perform Group Pager notifications.

1.6 Offsite notifications using the NAN Backup

1.6.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

1.6.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

1.6.3 Press the "Mode" button until the display indicates "GOVT AGENCY". The display will alternate between "GOVT AGENCY" and "ID - 710100". [handheld radio - enter "710100" on the keypad]

1.6.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

1.6.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

1.6.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

1.6.7 Record the time in Step 2 of the form.

1.6.8 Key the radio microphone and announce the following message: "ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.6.9 After a 30-second waiting period, repeat the preceding message.

1.6.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.6.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.6.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.6.13 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

1.6.14 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.6.15 Go to step 1.7 to perform Group Pager notifications.

1.7 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

1.7.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

1.7.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

1.7.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

1.7.4 If this offsite notification is the initial notification for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

2.0 Followup agency notifications

As directed, perform the actions associated with followup offsite agency notifications.

NOTE

Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), is to be completed after the initial notifications have been made and as soon as time permits. It should be prepared when information becomes available and transmitted to the Arizona Radiation Regulatory Agency when requested. It does not have to be completed if classification and termination were made with the same notification.

2.1 Complete the Follow-up Emergency Message Form

2.1.1 Complete Steps 1 and 14 from Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms). Complete Step 2.

2.1.2 Instruct the Radiation Protection Monitor / Radiological Assessment Coordinator to complete Steps 8, 9, and 10 of the form.

2.1.3 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 through 7 and 11 through 14 of the form, review the form for accuracy, and sign the form.

2.2 Fax the Follow-up Emergency Message Form

2.2.1 When the Follow-up Emergency Message Form has been requested by the Arizona Radiation Regulatory Agency, get the facsimile (FAX) telephone number to where it should be transmitted. Per the Emergency Coordinator's / Emergency Operations Director's instructions, transmit Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), to the Arizona Radiation Regulatory Agency via fax. When complete, inform the Emergency Coordinator / Emergency Operations Director that the Follow-up Emergency Message Form has been transmitted to the Arizona Radiation Regulatory Agency.

3.0 Emergency termination notifications

As directed, perform the actions associated with offsite agency emergency termination notifications.

NOTE

Notifications to State/County agencies per the Emergency Termination Message Form shall commence within 15 minutes following termination of the emergency declaration.

3.1 Authenticator codes

3.1.1 For initial notification and termination only, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope.

3.2 Completing the Emergency Termination Message Form

3.2.1 Complete Steps 1, 4, and 6 of EP-0543, Emergency Termination Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

3.2.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

3.3 Checking whether NAN is operational

If the NAN is operational, notify offsite agencies using step 3.4. If the NAN is not operational, notify offsite agencies using step 3.5.

3.4 Offsite notifications using the NAN

3.4.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

3.4.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.4.3 Repeat message once.

3.4.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.4.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.4.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.4.7 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

3.4.8 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.4.9 Go to step 3.6 for Group Pager notification.

3.5 Offsite notfications using the NAN Backup

3.5.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

3.5.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

3.5.3 Press the "Mode" button until the display indicates "GOVT AGENCY". (The display will alternate between "GOVT AGENCY" and "ID - 710100".) [handheld radio - enter "710100" on the keypad]

3.5.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

3.5.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

3.5.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

3.5.7 Record the time in Step 2 of the form.

3.5.8 Key the radio microphone and announce the following message:"ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.5.9 After a 30-second waiting period, repeat the preceding message.

3.5.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.5.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.5.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

3.5.13 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.5.14 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

3.5.15 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.5.16 Go to step 3.6 for Group Pager notification.

3.6 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

3.6.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

3.6.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

3.6.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

3.6.4 If this offsite notification is the initial notification and termination for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

Appendix E - ERDS Activation

1.0 For an Alert or higher Emergency Classification, activate the Emergency Response Data System in accordance with the following instructions.

1.1 10 CFR 50.72 states: "The licensee shall activate the Emergency Response Data System (ERDS) as soon as possible, but not later than one hour, after declaring an emergency class of alert, site area emergency, or general emergency. The ERDS may also be activated by the licensee during emergency drills or exercises if the licensee's computer system has the capability to transmit the exercise data." At PVNGS, ERFDADS sends information via ERDS to the USNRC at both the Regional Office and Headquarters on the Federal Telecommunications System (FTS) telephone lines through three dial-up modems (one per Unit). ERDS in all three Units can be active simultaneously.

1.2 If ERFDADS is not functioning, perform the following actions:

1.2.1 Inform the Emergency Coordinator that ERDS cannot be activated.

1.2.2 Notify the USNRC via the FTS-2000 (ENS) telephone and report that ERDS cannot be activated.

1.3 If the current Unit number shown in the top left corner of the display must be changed to transmit data for the applicable Unit, perform the following actions:

1.3.1 With the left mouse button, click on "Top Menu" at the lower left corner of the display.

1.3.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.3.3 When the System Functions Menu - 1 of 2 display appears, click on the "Unit/Server Switch" box.

1.3.4 When the Unit/Server Switch display appears, highlight the desired Unit.

1.3.5 When highlighted, click on the "Apply" button at the top of the display.

1.3.6 The display should read "Unit switched -- PROCEED."

1.3.7 Click on the "OK" button in the box.

1.4 Log into the system.

NOTE

Failing to activate ERDS within 15 minutes following logon will result in automatic logoff and the logon process must be reinitialized prior to ERDS activation.

1.4.1 With the left mouse button, click on "Options" toward the left end of the top menu bar.

1.4.2 When the "Options" pull-down menu appears, click on "Logon".

1.4.3 When the "R*TIME/X Password Entry" box appears, click on the empty rectangle box to place the flashing cursor in the box.

1.4.4 Type STA and click on the "Apply" button in the "R*TIME/X Password Entry" box.

1.4.5 The "Password Entry" box should disappear and logon is complete.

1.5 Activate ERDS.

1.5.1 Following logon into the system, click on "Top Menu" at the lower left corner of the display.

1.5.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.5.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.5.4 When the ERDS Communication Link display appears, highlight the "Activate" box.

1.5.5 When highlighted, click on the "Apply" button at the top of the display.

1.5.6 The "Activate" highlight should disappear and ERDS is activated.

1.6 ERDS status may be monitored as follows.

1.6.1 To display the status of the ERDS communication link, click on "Top Menu" at the lower left corner of the display.

1.6.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.6.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.6.4 When the ERDS Communication Link display appears, ensure that the information displayed indicates appropriate communications status and proper transmission of data.

1.7 Deactivate ERDS upon event termination. ERDS deactivation requires current system logon.

1.7.1 If system logon is required, use step 1.4.

1.7.2 Following system logon, click on "Top Menu" at the lower left corner of the display.

1.7.3 When the Top Menu display appears, click on the "System Function Displays" box.

1.7.4 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.7.5 When the ERDS Communication Link display appears, highlight the "Terminate" box.

1.7.6 When highlighted, click on the "Apply" button at the top of the display.

1.7.7 The "Terminate" highlight should disappear and ERDS is deactivated.

1.8 See Appendix O - ERFDADS operation for a list of data that is transmitted on ERDS.

Appendix F - Dose Projection

1.0 **Noteworthy items**

1.1 The MESOREM-JR computerized dose assessment program is the primary dose calculation method used for performing dose projections. If the primary method cannot be used at the preferred location, it should be performed at an alternate location and the dose projection results telecommunicated to the preferred location.

1.2 Printers shall not be connected to uninterruptible power supplies dedicated as backup power sources to computers designated for dose projection capability. If a computerized dose projection must be performed using an uninterruptible power supply as the sole power source, calculation results must be transcribed manually from the computer monitor display.

1.3 The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

1.4 The 1% failed fuel scenario should be selected unless plant conditions indicate severe (>10%) fuel clad failure.

1.5 Use of 100% fuel clad failure will project extreme levels of Iodine activity. If this scenario is used, Survey Teams must be made aware of the potential for extreme levels of Iodine activity and of the need to expedite data verification surveys. Since calculated doses are analytic estimates only, the calculations should be validated with field data as soon as possible. If calculated estimates differ considerably from associated field data, Emergency Operations Facility staff should use the "Back-Calculation" function to obtain an adjusted projection and the function should be repeated until a best-fit calculation correlates with the associated field data.

1.6 If the "F1 - Isolated Containment" option is selected from the Accident Menu, the Dose Projection Technical Basis Manual may be referenced for information pertinent to this accident scenario. Accordingly, correlation monitor values for Containment RMS Monitors RU-148 / RU-149 are also provided in the manual for instances when these monitors are inoperable or are not functioning properly.

1.7 Parameter entries must be in accordance with the options given for each, i.e., within a specified range, entered in a specific format, etc. Review each option. In cases where the actual value is less than the lowest range, or greater than the highest range value, enter the minimym or maximum allowable range value. Make a note of the actual value on page 4 of the printout.

1.8 If one projection is continued through a date change, and actual date on a menu screen will not be updated until that screen is exited and then re-entered on the new date. This will not affect the program results.

1.9 If RMS Monitors RU-139/140 are inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release. These default values, based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, will result in the issuance of very conservative Protective Action Recommendations. The Emergency Coordinator or Emergency Operations Director must be informed that values obtained are based on the assumption of 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release. A Survey Team must be dispatched immediately to the Site Boundary to verify the release levels.

1.10 RMS Monitors RU-139 / RU-140 will respond to N16 gamma during steam generator tube leakage at power operation in addition to designed activity monitoring. Use of at-power RU-139 / RU-140 monitor values could result in an extremely conservative dose projection. In this case, it is imperative to obtain a sample and repeat the dose calculation immediately after reactor scram.

1.11 During steam releases from specific plant systems, the possibility exists of the systems to achieve a solid condition. In these instances, any release would most likely become entrained with liquid. If this condition coincides with major steam generator tube failures, the projected Thyroid CDE value should be multiplied by a factor of 100.

1.12 The "F7 - Waste Gas Decay Tank Accident" selection on the Accident Menu is not appropriate for a surge tank or any tank / pathway gaseous release which may contain significant Iodine activity. The "F4 - Loss of Coolant Accident 1%" projection should be selected for any release containing potential Iodine activity (i.e., tank isolated for less than 45 days).

1.13 Unmonitored Release

Typical accident assumptions would indicate that a release is occurring which is not monitored by an RMS monitor, nor would there be any flow rate(s) available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release are a ruptured tank in the Radwaste yard which contained radioactive liquids, an outside fire involving radioactive waste, an accident involving waste shipment on site, an accident in the Radwaste Storage Building, etc. In all of these cases, release rates would typically be relatively low, but the potential would exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a MESOREM projection until actual Site Boundary data becomes available.

1.14 For unmonitored release events, the Survey Teams should be directed to obtain peak dose rate readings at the leading edge of the plume based on the current plume direction. The team(s) should be prepared to follow the leading edge as necessary. They should report current dose rates (closed window) which may be used as External EDE dose rates measured per hour for PAR determinations. The External EDE dose rates should be used, along with the current ERFDADS wind speed, to determine when the leading edge of the plume will reach the Site Boundary and what the dose rates will be at the time of arrival. Decay need not be taken into effect at this time. If Iodine shows any significance, the External EDE dose rate should be multiplied by 2. The net dose determined should be treated as TEDE for PAR purposes and Appendix B - Protective Action Recommendations, should be reviewed using this value to derive a qualified Protective Action Recommendation for the EC / EOD. In most cases, these actions will demonstrate Site Boundary dose to be minimal or zero, due to the low release rate. The team(s) should be instructed to obtain as many air samples as practicable to provide data for follow-up analyses. Appendix R - Dose Projection Technical Bases, provides additional methodologies and information which may be of use in several types of unmonitored scenarios.

2.0 MESOREM, Jr. startup

2.1 Select "MESOREM" from the functional display or select the MESOREM icon.

2.2 At the "PASSWORD" Prompt, type one of the following:

- STSC (for units inside the Protected Area)
- EOF (for the unit in the EOF and for program copies downloaded from the LAN)

2.3 At the "ID" Prompt, type 000000 (six zeroes).

2.4 Review the "Help" item that follows. Press <ENTER> when completed.

2.5 When the "Command Menu" appears, ensure that the "Current Time" field is correct toward the upper right portion of the display. If the time and/or date requires adjustment, select Q to quit and adjust the time and/or date accordingly. When complete, execute the previous steps to this point.

2.6 Re-evaluate the current time and date for accuracy.

2.7 Select <F2> ("Execute Dispersion Model").

NOTE

Selection <F2> ("Execute from Edited Files") on the "Mode-A Menu" display is employed only by Emergency Operations Facility personnel. Further guidance on this function may be obtained from the Dose Projection Technical Bases Manual.

2.8 When the "Mode-A Menu" display appears, select <F1> ("Fast Mode A - Initiate Model from Sequential Screens").

2.9 When the "Accident Menu" display appears, proceed to Section 3.0 of this document.

3.0 MESOREM, Jr. Mode A dose projection

3.1 When the "Accident Menu" appears as represented below, select the appropriate accident type:

3.1.1 F1 - Isolated Containment

3.1.2 F2 - Steam Generator Tube Rupture 1%

3.1.3 F3 - Steam Generator Tube Rupture 100%

3.1.4 F4 - Loss of Coolant Accident 1%

3.1.5 F5 - Loss of Coolant Accident 100%

3.1.6 F6 - Fuel Handling Accident

3.1.7 F7 - Waste Gas Decay Tank Accident

3.2 For the following prompts, enter the appropriate data as indicated:

3.2.1 Time Emergency Declared - enter the time the emergency was declared, as this entry will affect the plume mixing height. For back-calculations, enter the time the original event / release occurred.

3.2.2 Date Emergency Declared - enter the current date. For back-calculations, enter the appropriate date the original calculation was performed.

3.2.3 Adverse Weather or Normal Weather - enter Normal. Enter Adverse when weather / road conditions will delay evacuation times.

3.2.4 Expected Total Release Duration Time - if known, enter the expected duration of the release. If unknown, enter 2 hours initially. If release phase extends beyond 2 hours, enter values high enough to encompass total release phase time.

3.2.5 Has Release Been in Progress - enter Yes. Entering No will invoke the "Time Until Release Begins" Prompt, which allows for a bounding calculation based on degrading conditions and the release projected to begin in the future.

NOTE

The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

3.2.6 Time Release Has Been in Progress - enter the difference between the current time and the time the release began. Ensure that the time entered is less than the time entered for the "Expected Total Release Duration".

3.2.7 Has Reactor Been Scrammed - enter Yes if the source mix is decaying and is not directly attributable to a critical reactor.

3.2.8 Number of Hours and Minutes Since Scram - enter the difference between the current time and the time the source mix began to decay.

3.2.9 When the "Monitor Type Menu" appears, select the appropriate RMS Monitor for the applicable release path.

NOTE

Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, get weather information by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS.

3.2.10 Wind Speed - enter the 15-minute average of the 35-foot elevation wind speed parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 1 mph.)

3.2.11 Wind Direction - enter the 15-minute average of the 35-foot elevation wind direction parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 90º.)

NOTE

The default Delta-T used by the program is +18ºF, which is extremely stable, thus very conservative. Therefore, if ERFDADS meteorological data is unavailable and data has been obtained from the National Weather Service, a more appropriate Stability Class can be derived by selecting a Delta-T from the Alternative Delta-T Chart, as the National Weather Service is not able to provide Delta-T at PVNGS. The Stability Class will display after the Delta-T has been entered.

3.2.12 Delta-T - enter the 15-minute average Delta-T obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 18). If data has been obtained from the National Weather Service, select an appropriate Delta-T using the following Alternative Delta-T Table to derive an appropriate Stability Class

Alternative Delta T

Wind Speed, mph	Day (light)	Night (dark)
< 4	- 1.6° F	+ 4.0 ° F
4 - 7	- 1.4° F	+ 2.0° F
> 7 - 9	- 1.4° F	+ 1.0° F
> 9 - 13	- 1.0° F	- 1.0° F
> 13	- 1.0° F	- 1.0° F

3.2.13 The calculated mixing depth, presented in units of meters, will display after the Ambient Temperature is entered. The mixing depth correlates to the height at which the plume stops rising and levels out.

3.2.14 Ambient Temperature - enter the 15-minute average Ambient Temperature obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 62.)

3.3 Press <ENTER>.

NOTE

Selection <F1> ("Grab Sample Analysis Complete") on the "Breakdown Menu" display is employed only by Emergency Operations Facility personnel. Use of this function is addressed in the Dose Projection Technical Bases Manual. Selection <F2> ("Grab Sample Analysis Incomplete") assumes a default isotopic mix, with the projection based on RMS Monitor values and process flow rate.

3.4 When the "Breakdown Menu" appears, select <F2> ("Grab Sample Analysis Incomplete").

NOTE

Filter efficiencies for both the Plant Vent and Fuel Building Exhaust are assumed to be 95% when in operation and lined up through filtration. Prior to data entry, the associated system status must be verified. If status cannot be verified or the system associated with the applicable release point is not in operation and lined up through filtration, then filter efficiency is assumed to be 0%. All other release points are assumed to be 0% efficient. RU-148 / RU-149 values obtained from other sources may need to be converted to REM / hour for input into the system.

3.5 At the prompts requiring RMS Monitor data, process flow rate, and filter efficiency, enter the data associated with the applicable release point.

3.6 At the "Do you wish to revise effluent data again?" Prompt, enter Y if a review / correction of data is required or N to continue.

3.7 At the "Would you like an automatic dump to the printer" Prompt, enter Y to perform / print the calculation or N to review / transcribe the calculation results from the computer monitor display.

3.8 When the prompt "Will this be a simultaneous release?" appears, select the most appropriate response based on the following option summary:

3.8.1 Y - returns to the "Accident Menu" to allow for performance of a second projection using the same meteorological data to obtain summed doses. If this option is selected, the dose projection starting with step 2.0 must be performed a second time, after which the prompt "Do you wish to consider other release points?" will display. Select N after all release calculations have been performed. A summation dose report entitled "Simultaneous" will then be spooled to the printer.

3.8.2 N - invokes the "Receptor Display Menu", offering additional options for detailed reviews of the data. (These are generally employed by the Radiological Assessment Coordinator in the Emergency Operations Facility using the Dose Projection Technical Bases Manual).

3.9 When the "Receptor Display Menu" appears, select Q, which invokes the prompt "Do you wish to perform another forecast? [Y/N]." If another projection is required, enter Y and perform another projection from the "Accident Menu" starting with step 2.0. Enter N to continue with the existing projection from the "Command Menu" selections.

3.10 Transfer the printed report to the Radiation Protection Monitor in the Affected Unit STSC or to the Radiological Assessment Coordinator in the EOF as soon as possible. Additional copies of the printed report may be produced and distributed as required.

4.0 MESOREM, Jr. availability

4.1 MESOREM-JR is currently available in each Unit and in the EOF. The EOF MESOREM-JR computers are equipped with uninterruptible power supplies. Additionally, each location has MESOREM-JR available on a backup computer. A laptop computer in the EOF equipment locker is loaded with Windows 95 and Mesorem. This unit is intended to be used should an EOF relocation be necessary. An older laptop computer in the TSC equipment locker is loaded with Mesorem and intended to be available for use in a blackout condition (when normal power may be lost to much of the site). The Diesel Generator powering the TSC will provide power to run the laptop in that worst case situation.

4.2 A copy of the program is also available on PVNGS default Drive V: in Directory \Eplan\Mesorem\ for use by personnel in the Chemistry and Radiation Protection Groups to provide event support as required. However, the MESOREM-JR dose assessment program should not be executed on the LAN, as multi-user support is not possible. The program will run under MS Windows 95, MS Windows 98, or MS Windows NT (Version 4.0 or later) as a local copy. The program can also be executed on a computer running MS-DOS as the operating system.

4.3 To install MESOREM-JR from the LAN onto a local computer, create a directory on the local computer named MESOREM at the root level (i.e., C:\MESOREM). Download all MESOREM files from the LAN into the C:\MESOREM Directory on the local computer (2 MB HDD free space required). Execute the MESOREM.BAT File to start the program. (This action will place the user at the beginning of Section 2.0 in this procedure.) When finished with the program, delete all MESOREM files and the C:\MESOREM Directory from the local computer. Deletion of all MESOREM files on the local computer after use will ensure continuous synchronization of current MESOREM revision copies currently installed on all computers.

Appendix G - Core Damage Assessment

1.0 General Information

NOTE

This document directly supports PVNGS Unit 2 Sale / Leaseback Agreements. Any changes to or cancellation of the assessment methodology incorporated herein shall require review and approval by Arizona Public Service Company Law Department staff prior to implementation.

1.1 The APS employee tasked with performing the instructions within this document shall be current in qualifications and have records on file certifying successful completion of Training Course NGT69, Core Damage Assessment, or its equivalent, prior to performing the instructions within this document.

1.2 The principle method of core damage assessment (CDA) following an accident is based on radiochemistry data. Other plant indications may be available which can improve the estimation of core damage. These include incore temperature indicators, Containment radiation monitors, and the total quantity of Hydrogen released from Zirconium degradation. When possible, these additional indicators should be factored into the assessment.

1.3 PASS does not have the ability to obtain a sample representative of the water in the Containment sump until after a RAS occurs. Core damage estimates made using radiochemistry data during a small-break LOCA, in which a small amount of water is in Containment and a RAS has not yet occurred, shall only be made utilizing the off-gas data obtained from the Containment atmosphere and RCS samples. Once a RAS has occurred and suction has been transferred to the Containment sump, a sample can be obtained from the safety injection line.

1.4 The assessment of core damage obtained by using this document is only an estimate. The techniques employed in these instructions are only accurate in locating core conditions to within one or more of the ten (10) USNRC Fuel Damage Categories

1.5 Severe core damage does not occur uniformly. Damage occurring in regions of the core with higher power densities and along blocked channels will be more extensive than in other regions of the core. Therefore, the identification of a single USNRC Category may not sufficiently describe the actual damage state of the core. The most desired assessment is one made with the most accuracy and not necessarily the most conservatism.

1.6 Under emergency conditions, there can be extreme demands placed on the Chemistry Technician's time and on the sampling system. Conditions may change rapidly, requiring a re-evaluation of sample options and the cancellation of operations in progress to begin others. For this reason, it is important that efficient communications be established between the Shift Technical Advisor or Reactor Analyst, the Chemistry Coordinator, and the Emergency Coordinator.

2.0 Core Exit Thermocouple CDA Information

2.1 The assessment of core damage obtained by this method extends up to the time of clad rupture on most of the fuel rods. This time occurs early in very severe core uncovering accidents. More severe core damage cannot be quantified by the Core Exit Thermocouple (CET) assessment method.

2.2 The maximum CET temperature represents a low limit estimate of steam temperature and the peak core temperature could be up to 500ºF higher.

2.3 The curve in Figure 1 assumes that the fuel has been maintained at its rupture temperature for 10 minutes.

2.4 The CET temperature lags the steam temperature by about 6 minutes. Thus, this method is most appropriate for relatively slow core uncovering with a maximum temperature below the rapid oxidation initiation temperature of 1800ºF. A smooth CET recording and a time of 20 minutes (or longer) until the core uncovers are indicators for a reliable prediction of clad rupture.

2.5 If pressure drops below.100 psia within the first 2 minutes of indication of the accident, a large break is indicated and undetected core heatup will occur. Depending on the rate of refill, the thermocouple temperature may rise rapidly, then quench when the core is recovered. This method may yield very low estimates of clad rupture in these cases.

2.6 If the RCS pressure, at the time of maximum CET readings, is greater than 1650 psia, it could exceed the rod internal gas pressure, depending on burnup. This could cause clad collapse rather than clad ballooning. The clad rupture criteria for such rod collapse are less well defined. However, at temperatures in excess of 1800ºF (where the highest pressure curve on Figure 1 applies), clad failure sufficient to release fission gas is likely and this method can be used to obtain estimates of core damage.

2.7 If a peak CET temperature of 2200ºF is reached, over 50% of the rods have ruptured, regardless of core burnup or system pressure.

3.0 Containment Radiation Monitor (RMS) CDA Information

3.1 This method of core damage assessment relies upon radiation dose rate measurements taken from one or more monitors located inside the Containment Building to determine the total quantity of fission products released from the core. The quantity of fission products present at the location of the monitors may fluctuate rapidly due to transient plant conditions; therefore, multiple measurements within a minimum time frame are recommended. Samples obtained during rapidly changing plant conditions should not be weighed heavily in the assessment of core damage. If RU-148 and RU-149 are both not available for dose rate measurements, equivalent readings can be obtained from the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Assessment Coordinator in the Emergency Operations Facility.

3.2 This method is limited to the upper bounding condition of fission product release from the core due to fuel overheat. Concurrent with fuel overheat, there may be localized fuel pellet melting. This method does not attempt to identify the extent of any potential fuel melting, since the transport of non-volatile fission products released due to melting is not known.

3.3 This method is limited to the interpretation of the dose rate measurement resulting from a mix of fission products. Thus, this method cannot accurately distinguish between the conditions of fuel cladding failure and fuel overheat when the resulting dose rates are the same. This method does provide an upper limit estimate of the progressive core damage. Concurrent conditions of cladding failure and fuel overheat should be anticipated due to radial distribution of heat generation within the core.

3.4 A number of factors influence the reliability of the measured radiation dose rates upon which this method is based. Reliability is influenced by the ability to obtain representative measurements due to the incomplete mixing of the measured media and equipment limitations. The method relies on analytically determined values of the best estimate dose rates that are anticipated to correspond to the specific categories of core damage. These analytical values are based on assumptions made about the identity and the relative proportions of the fission products released from the core and their transport within Containment.

3.5 Dose rate measurements may have been obtained during transient conditions. Measurements taken during steady-state conditions should weigh more heavily.

3.6 Dose rates significantly above the lower bounds for the category of major fuel pellet overheat may indicate concurrent fuel pellet melting. This method may not be used to estimate the degree of fuel pellet melting.

3.7 Dose rates within the category of fuel overheating may be anticipated to include concurrent fuel cladding failure. This method may not be used to distinguish the relative contributions of the two categories to the total dose rate. The method does provide an estimate of the highest category of damage and assumes 50% of core Iodines are available for release to Containment. This number may be over-estimated, thus resulting in a non-conservative damage assessment.

3.8 Dose rates corresponding to the two categories of major fuel cladding failure and initial fuel overheat are observed to overlap in Figure 2. The evaluation of other plant parameters may be required to distinguish between them. However, concurrent conditions may be anticipated.

3.9 Several assumptions were made in the calculations performed to generate the graph of Figure 2. They include:

3.9.1 The distribution of all airborne radionuclides in the Containment atmosphere is homogeneous.

3.9.2 The dose rates were measured at the Containment top-centerline.

3.9.3 The Containment Spray System has operated for 2 hours and has effected a halogen reduction by a factor of 7.

3.9.4 The gamma flux at the detector was determined by the point kernel method.

4.0 Hydrogen Production CDA Information

4.1 This method of core damage assessment is not a unique indicator of the amount of core clad oxidation, since the Hydrogen in Containment contains a mixture of Hydrogen generated within the core by clad oxidation and also Hydrogen from radiolytic dissociation of water and oxidation of aluminum and zinc.

4.2 This method only provides an estimate of the percentage of rods which have progressed to at least clad rupture or clad embrittlement. It does not attempt to predict the physical configuration of these rods which have progressed beyond local clad fragmentation.

4.3 Depending on the accident conditions, a given total amount of Hydrogen produced by oxidation of the fuel clad can represent varying local amounts and distributions of clad damage. This method biases the damage estimates such that the results represent lower limit estimates of clad damage.

4.4 The basis for this assessment assumes zero inlet flow into the core and also assumes the two-phase level within the core is uniform across the entire core.

4.5 By the time that 0.5% of the core clad has oxidized during boil-off, between 40% and 100% of the rods can be considered to be ruptured, depending on system pressure. Hydrogen measurement serves only as a backup to more sensitive methods of determining clad rupture. If the Hydrogen measurement indicates greater than 20% of the clad has oxidized, then substantial core damage is certain, regardless of the particular reflood scenario. For a given percent of oxidation of the core clad, the lower limit estimate of embrittled clad in the assessment of the percent of embrittled fuel rods is for most scenarios, which presents the least amount of potential structural damage. The actual damage is probably greater.

4.6 When the pressure during core uncovering is less than about 100 psia, a rapid core uncovering by blowdown has probably occurred. Heatup with minimum clad oxidation occurs. The extent of potential clad structural failure by melting may be greater than the upper limit of embrittlement as determined by core clad oxidation.

4.7 If inlet flow exists while the core is uncovering, the rate of uncovering is slower than was assumed for the derived curves of the figures used in this method. For a measured total amount of oxidation, the local percentage of oxidation is probably greater along a shorter length of the upper portions of the fuel.

4.8 This method is not acceptable under conditions where a void exists in the Reactor Coolant System.

5.0 Radiological Analysis CDA Information

5.1 This method relies on samples obtained from multiple locations inside the Containment Building to determine the total quantity of fission products released from the core. The amount of fission products present at each sample location may be changing rapidly due to transient plant conditions. Therefore, an accurate assessment requires that the samples be completed within a minimum time period and obtained under stabilized plant conditions. Samples obtained during rapidly changing plant conditions should not be weighed heavily into the assessment of core damage.

5.2 Samples obtained during the accident at TMI-2 indicate that the amount of Iodine predicted to be released is grossly over-estimated.

5.3 A number of factors influence the reliability of the Chemistry samples upon which this method is based:

5.3.1 Reliability is influenced by the ability to obtain representative samples due to incomplete mixing of the fluids and by equipment limitations.

5.3.2 The accuracy achieved in the radiological analyses are also influenced by a number of factors:

5.3.2.1 The equipment employed in the analysis may be subjected to high levels of radiation exposure over extended periods of time.

5.3.2.2 Technicians are required to exercise considerable caution to minimize the spread of radioactive materials.

5.3.2.3 Samples have the potential of being contaminated by numerous sources and may not be representative.

5.3.2.4 Plate-out, precipitation, and chemical reactions may take place in the long sample lines. Therefore, the results obtained may not be representative of actual plant conditions.

5.3.3 To minimize these effects, multiple samples should be obtained over an extended time period from each location.

6.0 Core Damage Evaluation

6.1 The core damage estimate methods presented are not required to be performed in any given order and all methods may not be appropriate for the given accident scenario. However, it is recommended that as many applicable methods as necessary be used prior to making a final assessment of core damage. The figures in this document will aid in the assessments.

6.2 For core damage assessment using Core Exit Thermocouples, complete Form EP-0511, Core Exit Thermocouple CDA (see Appendix C - Forms).

6.3 For core damage assessment using Containment radiation monitors, complete Form EP-0512, Containment RMS CDA (see Appendix C - Forms).

6.4 For core damage assessment using Hydrogen production, complete Form EP-0513, Containment Hydrogen CDA (see Appendix C - Forms)

6.5 For core damage assessment using radiological analysis, complete Form EP-0514, Containment Radiochemistry CDA (see Appendix C - Forms).

6.6 When all applicable methods for assessing core damage have been completed, make a final assessment utilizing all available information from the four methods of assessment. The final assessment requires sound engineering judgment and knowledge of all biases and assumptions discussed under Personnel Indoctrination in Section 1.0 through 5.0 of this document.

6.7 Using the previously mentioned considerations, evaluate the final assessment of core damage for accuracy.

6.8 Using section 7.0, Fuel Damage Categories, compare the results obtained for the final core damage assessment to the USNRC Categories of Fuel Damage and select the category most accurately matching that derived in the final assessment.

6.9 Report the results obtained from the comparison to the Emergency Coordinator as soon as possible.

7.0 **Fuel Damage Categories**

7.1 Use the table below for comparisons with the final core damage assessment obtained in steps 6.2 through 6.9.

CATEGORY	FUEL DAMAGE
1	No Fuel Damage
2	Initial Cladding Failure
3	Intermediate Cladding Failure
4	Major Cladding Failure
5	Initial Fuel Pellet Overheating
6	Intermediate Fuel Pellet Overheating
7	Major Fuel Pellet Overheating
8	Fuel Pellet Melt
9	Intermediate Fuel Pellet Melt
10	Major Fuel Pellet Melt

7.2 Clad damage characteristics of fuel damage

CLAD DAMAGE CHARACTERISTICS OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	TEMPERATURE RANGE °F	MECHANISM OF DAMAGE	CHARACTERISTIC MEASUREMENT	MEASUREMENT RANGE	PERCENT OF DAMAGED RODS
1. No Fuel Damage	750	None			< 1
2. Initial Cladding Failure			Maximum Core Exit Thermocouple Reading	< 1550°F	< 10
3. Intermediate Cladding Failure	1200-1800	Rupture Due to Pin Overpressure		< 1700°F	10-50
4. Major Cladding Failure				< 2300°F 1-5% Oxidation	> 50
5. Initial Fuel Pellet Overheating	1800-3350			Core Oxidation 1-5%	< 10
6. Intermediate Fuel Pellet Overheating		Loss of Structure Integrity Due to Fuel Clad Oxidation	Amount of Hydrogen Gas Produced *(Equivalent to % of Core Oxidation)*	5-20%	10-50
7. Major Fuel Pellet Overheating	3450			20-65%	> 50

NOTE: This table is to be used for both the CET and Hydrogen methods of core damage assessment

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7.3 Dose rate characteristics of USNRC categories of fuel damage

DOSE RATE CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY	DISTRIBUTION OF FISSION PRODUCTS IN CONTAINMENT
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	< 1%	Airborne
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	< 10%	Airborne
3. Intermediate Cladding Failure		Gas Gap	10-50%	Airborne
4. Major Cladding Failure		Gas Gap	> 50%	Airborne
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	< 10%	Airborne: 100% Noble Gas 25% Halogen Plated Out: 25% Halogen 1% Solids
6. Intermediate Fuel Pellet Overheating		Fuel Pellet	10-50%	
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet	> 50%	

NOTE: This table is to be used for the Containment Radiation Monitor method of core damage assessment

7.4 Radiological characteristics of USNRC categories of fuel damage

RADIOLOGICAL CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	CHARACTERISTIC ISOTOPE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	I^{131}, Cs^{137}, Rb^{88}	< 1%
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	Xe^{131m}, Xe^{133}, I^{133}	< 10%
3. Intermediate Cladding Failure		Gas Gap		10-50%
4. Major Cladding Failure		Gas Gap		> 50%
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	Cs^{134}, Rb^{88}, Te^{129}, Te^{132}	< 10%
6. Intermediate Fuel Pellet Overheating		Fuel Pellet		10-50%
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet		> 50%
8. Fuel Pellet Melt	Escape from Molten Fuel	Fuel Pellet	Ba^{140}, La^{140}, La^{142}, Pr^{144}	< 10%
9. Intermediate Fuel Pellet Melt		Fuel Pellet		10-50%
10. Major Fuel Pellet Melt		Fuel Pellet		> 50%

NOTE: This table is to be used for the Radiochemistry method of core damage assessment

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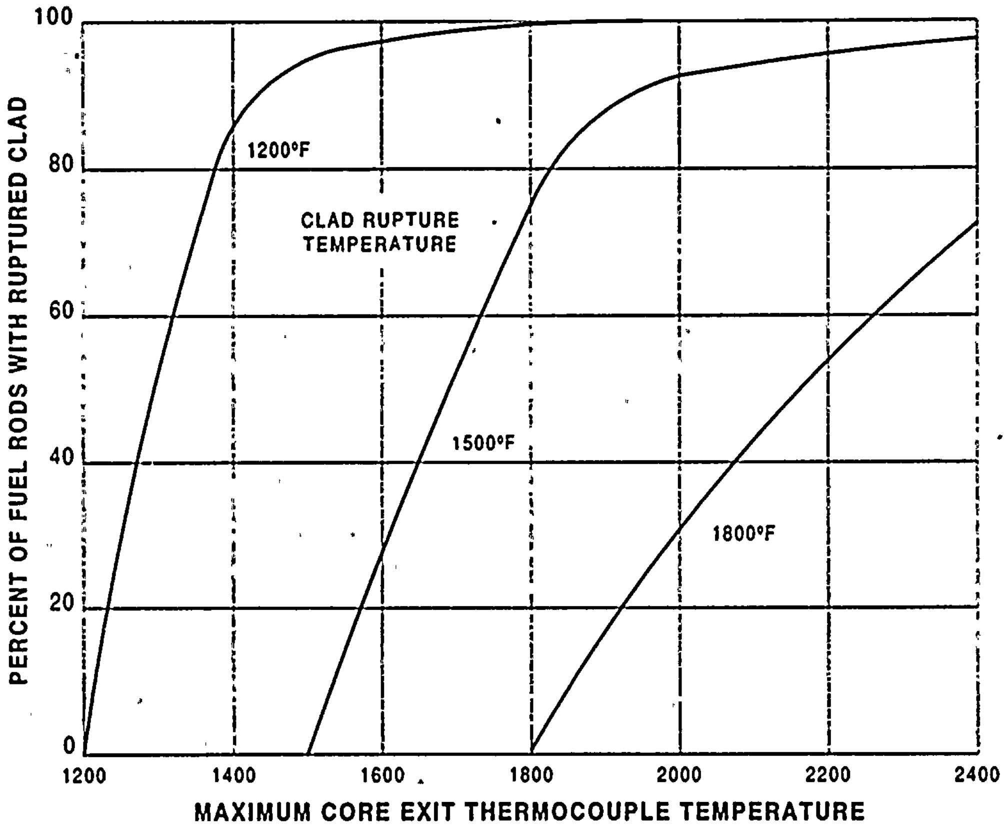
8.0 Figures

8.1 Figure 1 - Percent of fuel rods with ruptured clad vs. maximum Core Exit Thermocouple temperature

FIGURE 1

PERCENT OF FUEL RODS WITH RUPTURED CLAD vs MAXIMUM CORE EXIT THERMOCOUPLE TEMPERATURE

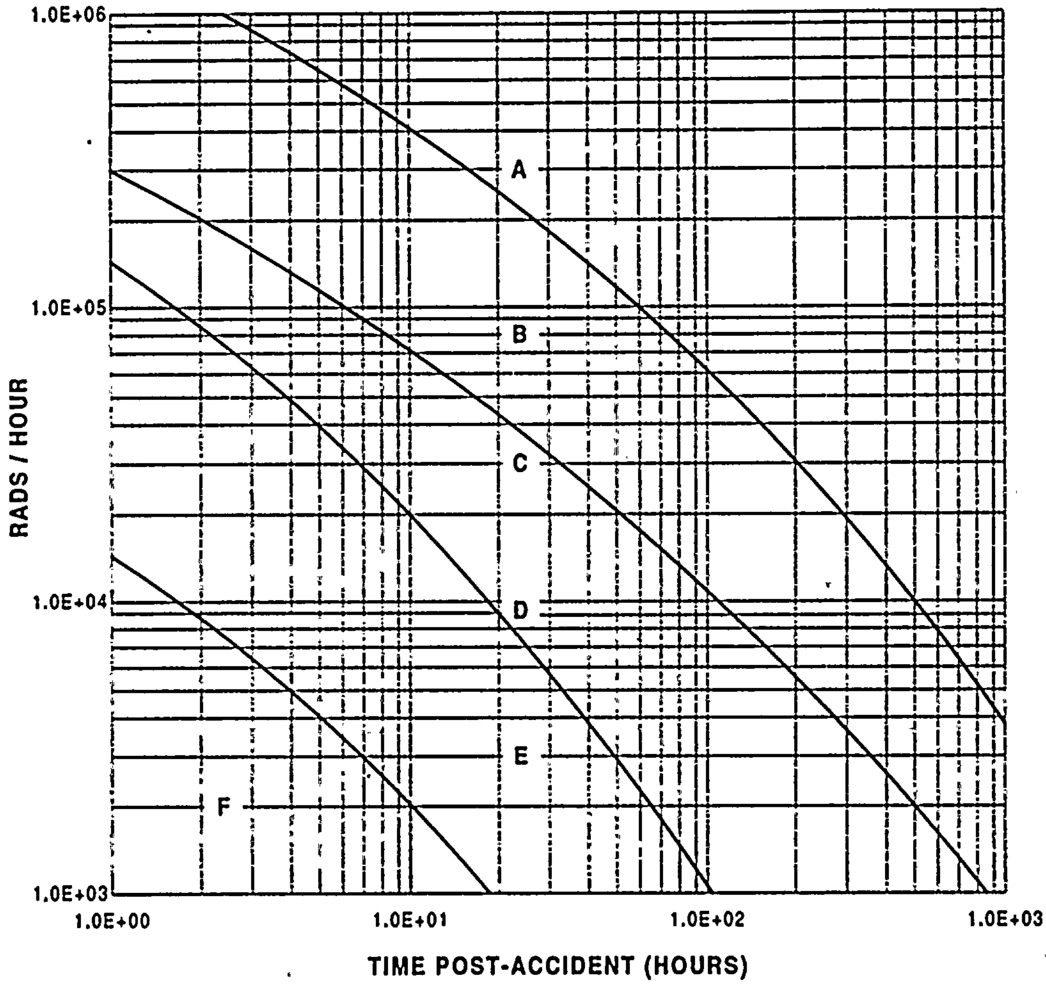


When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.2 Figure 2 - CDA by Containment radiation level

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL

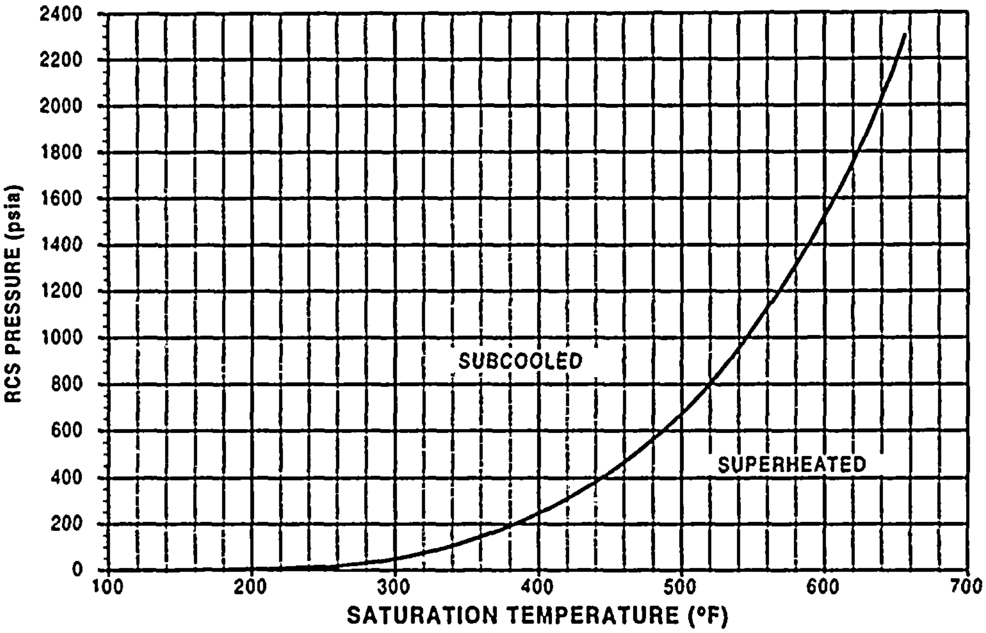


A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

8.3 Figure 3 - Pressure vs saturation temperature

FIGURE 3

PRESSURE vs SATURATION TEMPERATURE



8.4 Table - Pressure vs saturation temperature

PRESSURE vs SATURATION TEMPERATURE													
psia	xF	psia	xF	psia	xF	psia	xF	psia	xF	psia	xF	psia	xF
20	228.0	130	347.3	240	397.4	550	476.9	1100	556.3	1650	609.1	2400	662.1
30	250.3	140	353.0	250	401.0	600	486.2	1150	561.8	1700	613.1	2500	668.1
40	267.3	150	358.4	260	404.4	650	494.9	1200	567.2	1750	617.1	2600	673.9
50	281.0	160	363.6	270	407.8	700	503.1	1250	572.4	1800	621.0	2700	679.5
60	292.7	170	368.4	280	411.1	750	510.8	1300	577.4	1850	624.8	2800	685.0
70	302.9	180	373.1	290	414.3	800	518.2	1350	582.3	1900	628.6	2900	690.2
80	312.0	190	377.5	300	417.4	850	525.2	1400	587.1	1950	632.2	3000	695.3
90	320.3	200	381.8	350	431.7	900	532.0	1450	591.7	2000	635.8	3100	700.3
100	327.8	210	385.9	400	444.6	950	538.4	1500	596.2	2100	642.8	3200	705.1
110	334.8	220	389.9	450	456.3	1000	544.6	1550	600.6	2200	649.5	3208	705.5
120	341.3	230	393.7	500	467.0	1050	550.5	1600	604.9	2300	655.9		

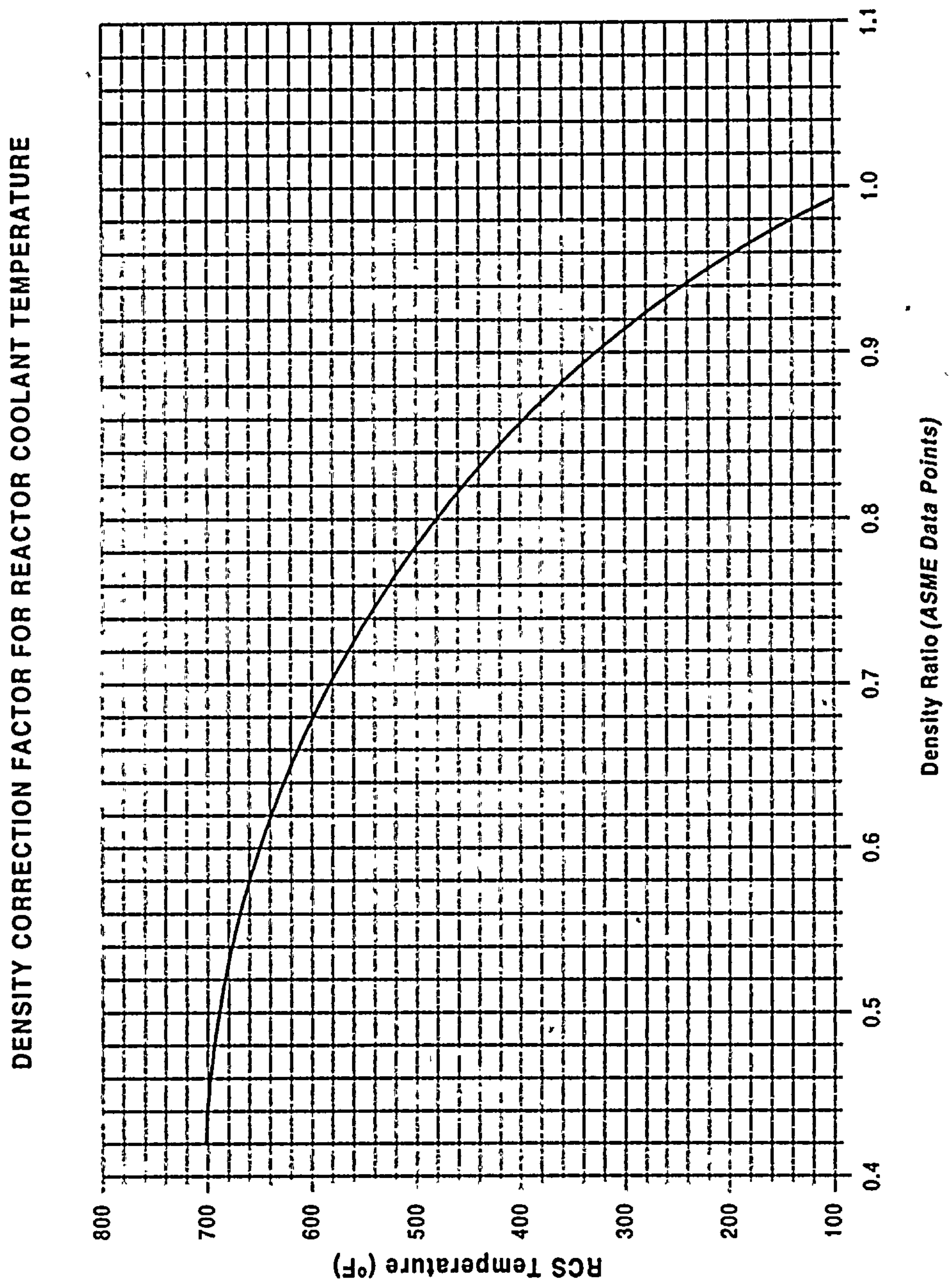
8.5 Figure 4 - RCS vessel level vs. volume

8.5.1 When the RCS is full, the RCS volume = 3.78E+08 cc. To determine the RCS water volume when the RCS is not full, the Reactor Vessel Level Monitoring System (RVLMS) is used. This system includes 8 detectors located at different levels in the reactor vessel. The approximate RCS level can be determined by how many detectors have uncovered. The information below provides the volume to be used at each detector location:

DETECTOR	VOLUME BELOW *(cc)*
HJTC #1	1.51E+08
HJTC #2	1.37E+08
HJTC #3	1.22E+08
HJTC #4	1.08E+08
HJTC #5	1.02E+08
HJTC #6	9.68E+07
HJTC #7	9.12E+07
HJTC #8	8.57E+07

8.6 Figure 5 - Density correction factor for reactor coolant temperature

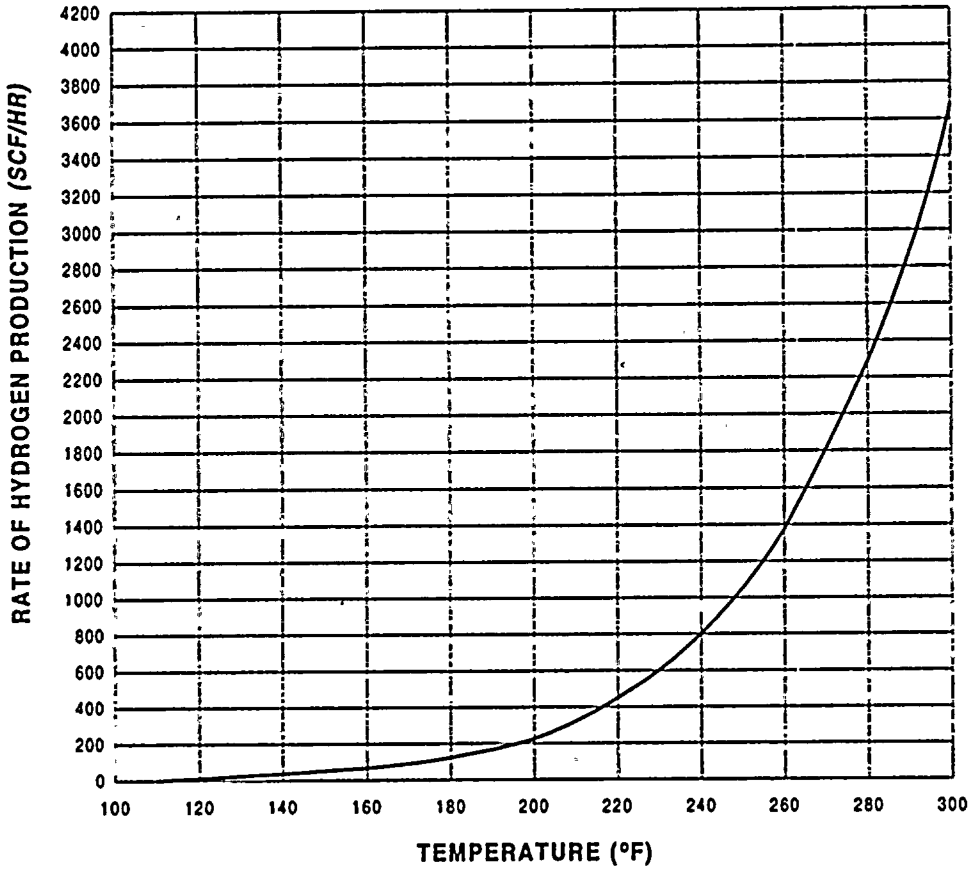
FIGURE 5



8.7 Figure 6 - Hydrogen production rate from aluminum and zinc vs. temperature for PVNGS

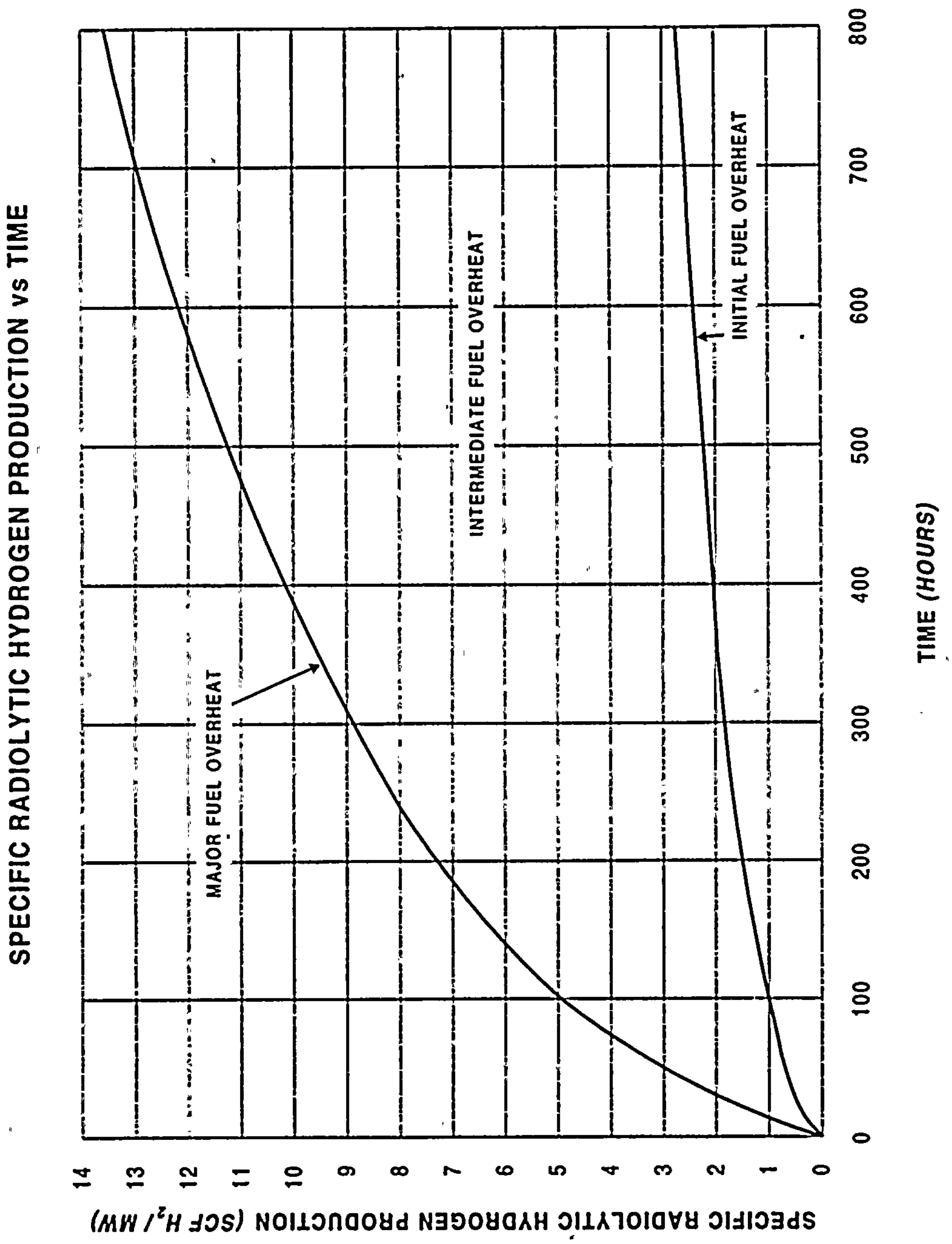
FIGURE 6

HYDROGEN PRODUCTION RATE FROM ALUMINUM AND ZINC vs TEMPERATURE FOR PVNGS



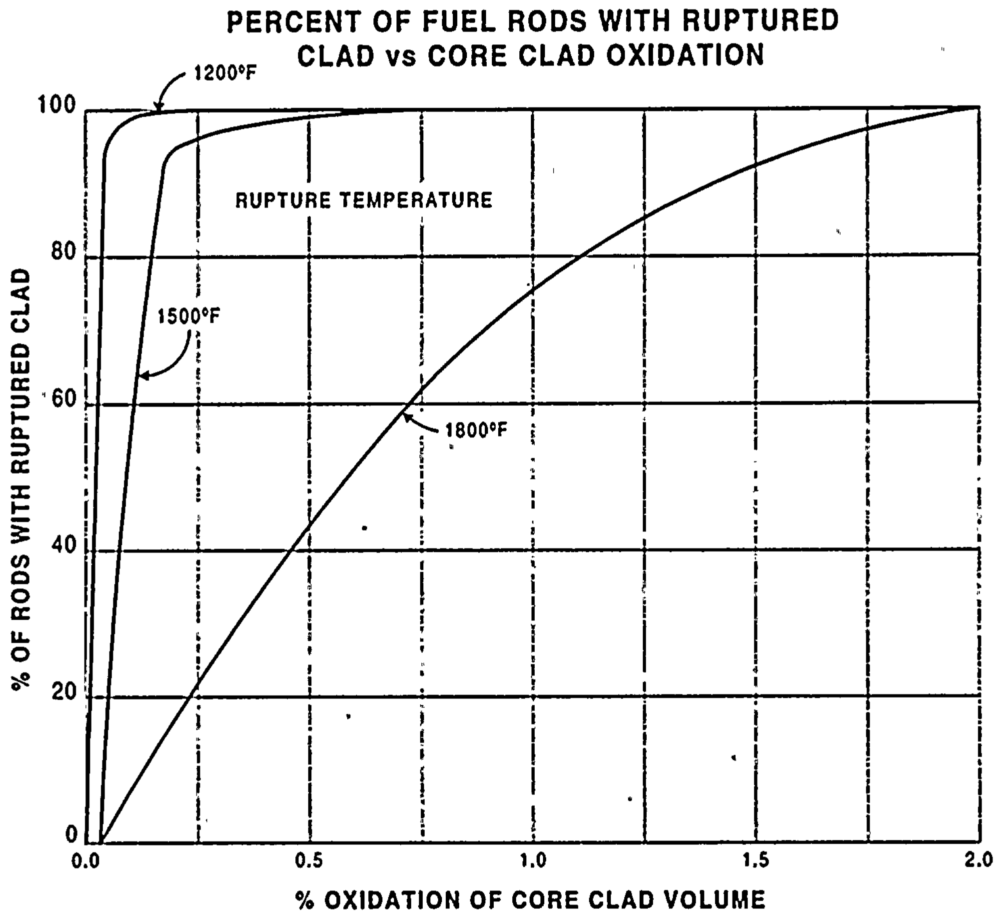
8.8 Figure 7 - Specific radiolytic hydrogen production vs. time

FIGURE 7



8.9 Figure 8 - Percent of fuel rods with ruptured clad vs. core clad oxidation

FIGURE 8

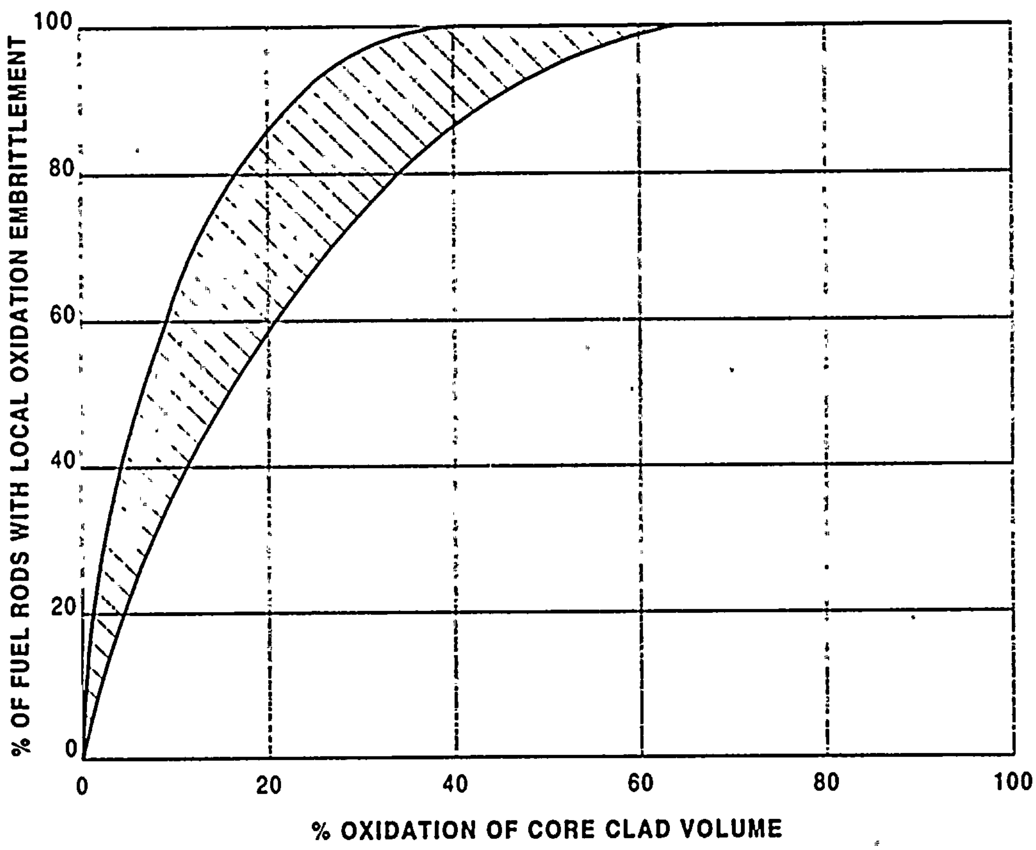


When the pressure In Form EP-0513, Step 2, Is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.10 Figure 9 - % of the fuel rods with oxication embrittlement vs. total core oxidation for 1% to 3% decay heat and 300 PSIA to 2500 PSIA when coolant level drops by boil-off with no inlet flow until core is rapidly quenched

FIGURE 9

% OF THE FUEL RODS WITH OXIDATION EMBRITTLEMENT vs TOTAL CORE OXIDATION FOR 1% TO 3% DECAY HEAT AND 300 PSIA TO 2500 PSIA WHEN COOLANT LEVEL DROPS BY BOIL-OFF WITH NO INLET FLOW UNTIL CORE IS RAPIDLY QUENCHED



8.11 Figure 10 - Sample locations appropriate for core damage assessment

FIGURE 10

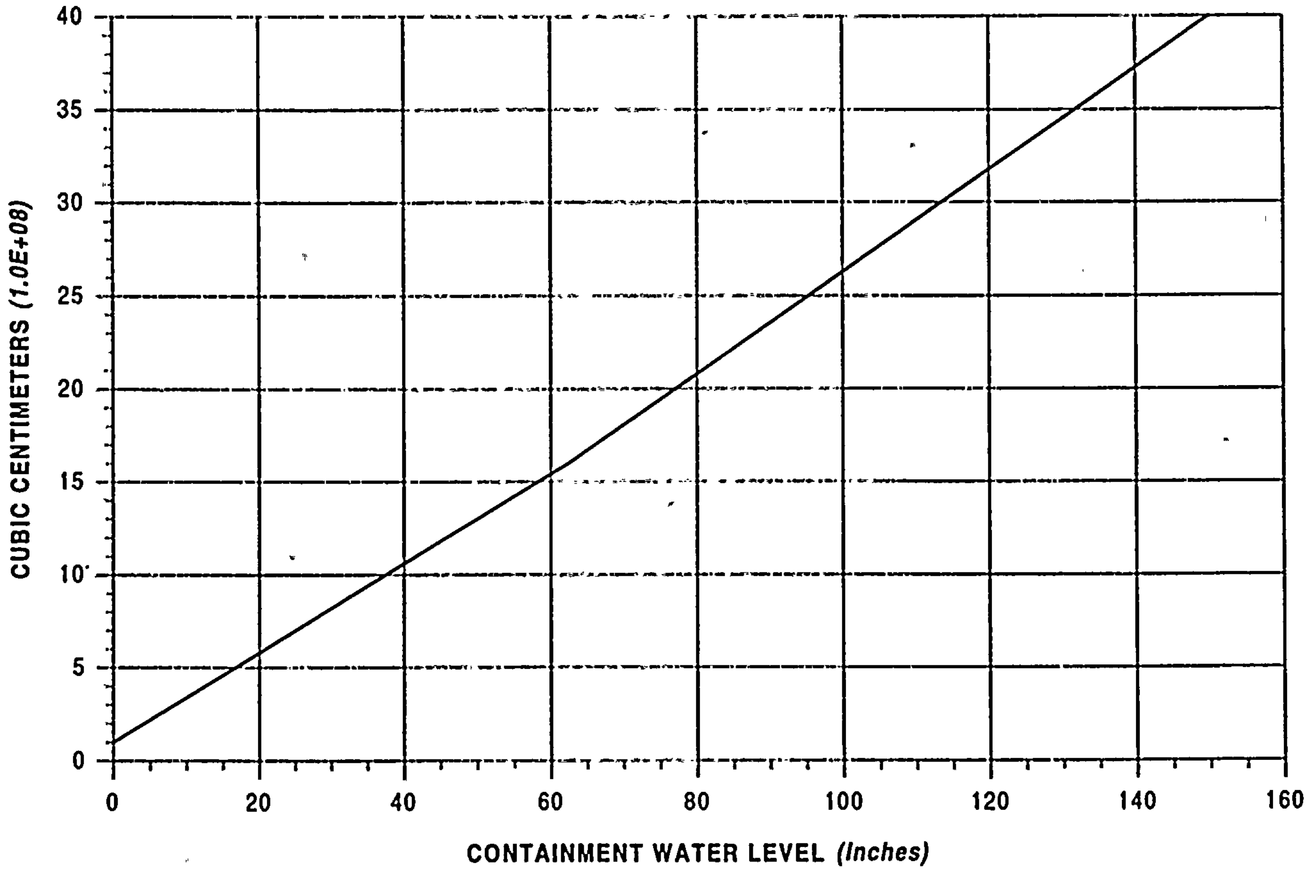
SAMPLE LOCATIONS APPROPRIATE FOR CORE DAMAGE ASSESSMENT

ACCIDENT SCENARIO	RCS HOT LEG	CONTAINMENT SUMP	CONTAINMENT ATMOSPHERE	SHUTDOWN COOLING
Small Break LOCA Reactor Power > 1%	YES	....	YES	YES
Small Break LOCA Reactor Power < 1%	YES	....	....	YES
Small Steam Line Break	YES	....	....	....
Large Break LOCA Reactor Power > 1%	YES	YES	YES	YES
Large Break LOCA Reactor Power < 1%	....	YES	YES	YES
Large Steam Line Break	YES	....	YES	....
Steam Generator Tube Rupture	YES	....	YES	....

FIGURE 11

8.12 Figure 11 - Containment water volume vs. Containment water level

CONTAINMENT WATER VOLUME vs CONTAINMENT WATER LEVEL



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Appendix H - Autodialer Activation

NOTE

If the declared emergency situation is terminated prior to activation of the autodialer, do not activate the autodialer. The Shift Manager / Emergency Coordinator will direct the use of the autodialer. If the autodialer cannot be activated from the PVNGS Technical Support Center, contact Emergency Planning for assistance.

1.0 Activating the autodialer.

1.1 Power up the autodialer unit.

1.2 When the "ATERM" screen appears, press <F2>.

1.3 At the "Enter Password" prompt, type mlog and press <ENTER>.

1.4 Select the "Administrator" option and press <ENTER>.

1.5 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.6 Type your password and press <ENTER>.

1.7 Scroll down slowly and highlight the appropriate option from the following choices:

1.7.1 Unit 1 Setup (for Emergency Response Notifications)

1.7.2 Station Setup (for Fire Department activation)

1.8 When the appropriate option is highlighted, press <ENTER>.

1.9 Highlight the appropriate selection from the following choices:

1.9.1 E (actual emergency) / (classification)

1.9.2 D (drill) / (classification)

1.9.3 T (test) / (classification)

1.10 When the appropriate selection is highlighted, press <ENTER>.

1.11 When the "Working - Please Wait" dialog box disappears, press <ESC> two times.

NOTE

There may be a file transfer operation at this point. In a case of the file transfer dialog on the screen, wait until file transfer is completed (dialog box disappears) before continuing on to next step.

1.12 Select the "Administrator" option again and press <ENTER>.

1.13 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.14 Type your password and press <ENTER>.

1.15 Select the appropriate designator from the following choices:

1.15.1 Emergency Activation

1.15.2 Drill Activation

1.15.3 Test Activation

1.16 When the appropriate option is highlighted, press <ENTER>.

1.17 Select the appropriate Unit and press <ENTER>.

CAUTION

Selecting the option "Yes" (Y) in the next step STARTS activation. There is no additional confirmation step to allow you to back out of an activation prior to its commencement if you select the "Yes" option.

1.18 At the prompt "You have selected system (Emergency/Drill/Test) Activation for (UNIT 1/2/3/PVNGS STATION) location. The system is not currently staffing. Are you certain that you wish to continue?", type Y (yes) or N (no).

1.19 Ensure that the system has been activated by verifying the appearance of status screens displaying Emergency Response Organization position information as responders are reached.

1.20 If the autodialer failed to activate or failed to complete the notification process, notify the Shift Manager / Emergency Coordinator that the autodialer in the Technical Support Center failed the activation process. If necessary, inform the Emergency Coordinator of the current status of the system.

2.0 Terminating the autodialer activation.

2.1 From the "Monitoring Staffing for Unit (1/2/3/PVNGS Station)", select <F2> "Stop Staffing".

2.2 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.3 Type your password and press <ENTER>.

2.4 A "Real Time" fax report dialog box will display followed by a "Working - Please Wait" dialog box. When the "Working - Please Wait" dialog box disappears, the "Monitoring Staffing" screen also disappears.

2.5 The main Coordinator screen appears with "(RE)ACTIVATED, NOT STAFFING" in the left side of the upper box on the screen.

2.6 Select the "Administrator" option and press <ENTER>.

2.7 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.8 Type your password and press <ENTER>.

2.9 Select the "RESET" option and press <ENTER>.

2.10 After the "Working - Please Wait" dialog box disappears, press the <ESC> key once.

2.11 Select the <CTRL> + <RIGHT SHIFT> (Hold down the "control" key and simultaneously press the "Shift" key on the right hand side of the keyboard), to bring up the ATERM SPECIAL FUNCTIONS dialog box. Highlight "END ATERM SESSION" and press <ENTER>.

2.12 The ATERM Login screen should appear. This action terminates the modem session from the workstation to the Autodialer.

2.13 When emergency notifications have been completed, inform the Emergency Coordinator of any unaffirmed Emergency Response Organization positions.

Appendix I - Assembly

1.0 General information

1.1 Assembly is recommended at the Alert classification level unless the Emergency Coordinator is reasonably assured that the condition does not have the potential to further degrade. Accountability is required for a Site Area Emergency or a General Emergency and must be completed within 30 minutes following the request for Accountability. Accountability does not have to be performed immediately following the request for Assembly.

1.2 Designated Assembly Areas within the Protected Area are the Control Room/Satellite Technical Support Center, Technical Support Center, Operations Support Center, and Containment (Modes 5, 6, and Defueled, if appropriate). Designated Assembly Areas beyond the Protected Area are major buildings within the Owner Controlled Area having the capability of receiving Plant Paging System announcements.

1.3 Essential personnel are Emergency Response Organization personnel currently required for duty, and individuals engaged in Emergency Coordinator authorized critical work. If directed, essential personnel in an Unaffected Unit who normally respond to their Assembly Area will respond to the Affected Unit Assembly Area.

1.4 If the Security Computer System is not functioning, Security personnel will manually account for Protected Area personnel at Security Headquarters. Protected Area Assembly Area supervision will accommodate accordingly at each of their respective locations.

2.0 Emergency Coordinator actions

2.1 For Assembly/Accountability (required for SAE and GE, optional for Alert), perform the following:

2.1.1 Sound the Unit Assembly Signal for approximately 30 seconds.

2.1.2 Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a ____________________ exists in Unit ____. Assembly is required. All personnel report to your designated Assembly Area." Provide instructions on areas to avoid as appropriate.

2.1.3 Repeat sounding the Unit Assembly Signal and the message once. This responsibility can be delegated.

2.1.4 Direct the Security Director to complete supplemental onsite notifications and activate the autodialer (6470 / 6471 / 6472, 4444, or dedicated line or radio).

2.1.5 Personnel assembly is accomplished as follows:

2.1.5.1 Personnel in Containment are to secure work safely, report to the 140' hatch, and await instructions.

2.1.5.2 Emergency Response Organization members are to report to their Emergency Response Facilities.

2.1.5.3 Personnel in the Protected Area engaged in EC-authorized critical work are to report to the OSC, STSC, or TSC and card in on the ACAD card reader before returning to work.

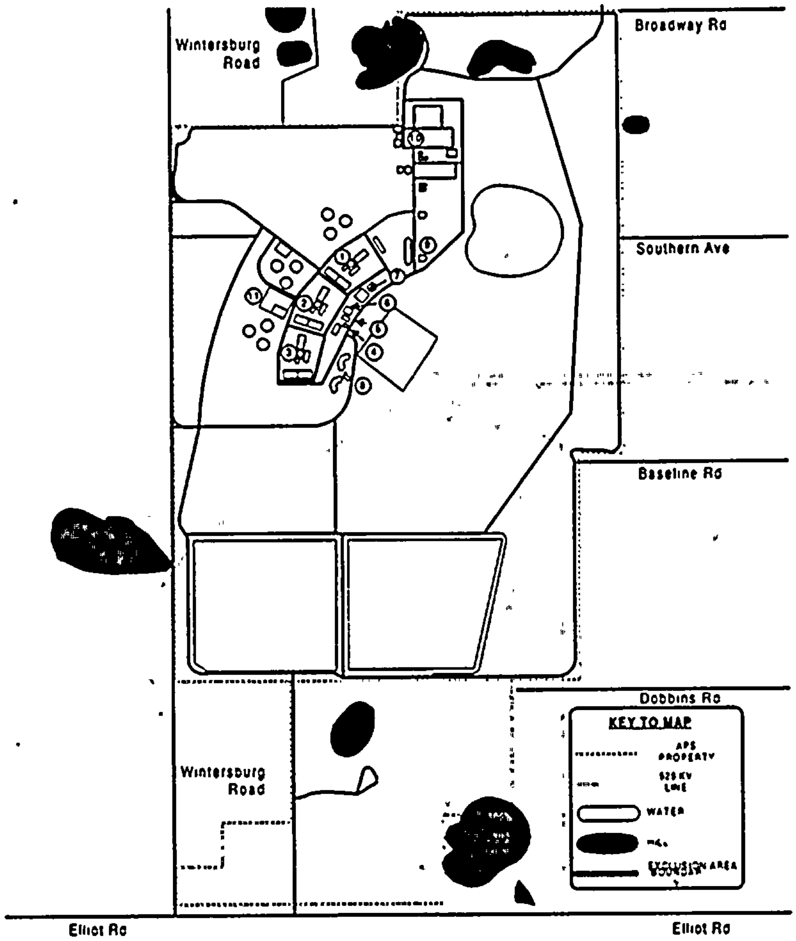
2.1.5.4 All other personnel, whether inside or outside the Protected Area., are to report to the nearest Assembly Area outside the Protected Area. These are considered to be non-essential personnel.

2.1.6 Ensure that assembling personnel each register their ACAD in the card reader. If the ACAD card reader is inoperable, direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms). Collect all forms and fax them to CAS.

2.1.7 To terminate Assembly by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.1.8 To terminate Assembly by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

The following site map details designated Assembly Areas to be used for assembling personnel when Assembly has been directed by the Emergency Coordinator.



Protected Area	Owner Controlled Area
1. Unit 1 Power Block	6. Building D
2. Unit 2 Power Block	7. Buildings E and F
3. Unit 3 Power Block	8. Buildings A, B, C
4. Security Headquarters	9. Transportation
5. Technical Support Center	10. Water Reclamation Facility Admin
	11. North Annex and Warehouse

2.2 If Accountability is to be conducted after Assembly, perform the following:

2.2.1 Request CAS Security personnel (6470 / 6471 / 6472, or 4444, or dedicated line or radio) to perform Accountability and to provide the report within 30 minutes.

2.2.2 Advise the Security Director to locate any unaccounted individuals.

2.2.3 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

2.2.4 Maintain continuous accountability of STSC personnel after Assembly. It is the position of PVNGS management that continuous accountability be maintained by knowledge of those individuals inside, and controlling access to, the Protected Area. Specific locations, i.e., Sector designation, of individuals inside the Protected Area may be ascertained by various methods, such as use of the Security Computer System and associated ACAD card readers, use of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms) in the OSC, Protected Area Assembly Area Supervisor knowledge, and Central Alarm Station (CAS) Operator knowledge. It is through a combination of these available administrative resources that continuous accountability of personnel inside the Protected Area can be maintained. The responsibility for maintaining continuous accountability of personnel within the envelope of each of the emergency response facilities within the Protected Area lies with the appropriate facility manager.

2.2.5 To terminate Accountability by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.2.6 To terminate Accountability by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

2.2.7 To terminate Accountability by a Site Evacuation, see Appendix J - Site Evacuation.

3.0 **Security Director actions**

3.1 When Assembly is directed, search the following areas in each Unit:

3.1.1 A-213 / A-217, CEDMCS Rooms

3.1.2 AC-04 / AC-13, Containment Spray Pump Rooms

3.1.3 AC-05 / AC-10, LPSI Rooms

3.1.4 AB-08, Gas Stripper Room

3.1.5 AB-02 / AB-10 / AB-11, 77' / 87' Mechanical Penetration Rooms

3.1.6 Y-105 / Y-106, 84' Pipe Density Tunnel

3.1.7 F-106, Fuel Cask Loading Area

3.1.8 R-211, 120' Radwaste Control Room

3.1.9 A-108 / A-109, 100' EW Heat Exchanger Rooms

3.1.10 A-124 / A-123, 88' Essential Pipe Chase

3.1.11 A-231 / A-232, Valve Gallery

3.1.12 A-210 / A-217 / A-218, Boron Injection Rooms

3.1.13 A-312 - R-303 - R-308, Waste Gas Panel Aisle

3.1.14 Y-101, 90' Nuclear Cooling Condensate

3.1.15 C-111, MSSS 100' Valve and Pipeway Area

3.1.16 Y-102 / Y-103, Spray Pond Pump Rooms

3.1.17 TSC Diesel Room

3.2 Search the following non-designated Assembly Areas and buildings outside the Protected Area for personnel:

3.2.1 Evaporation Ponds

3.2.2 SRP Switchyard

3.2.3 80-Acre Lake

3.2.4 Site Landfill

3.2.5 Neutrino Facility

3.3 When searches have been completed, advise Secondary Alarm Station personnel of the search status.

3.4 Lock down the Protected Area.

3.5 Notify the Water Reclamation Facility Control Room of the Assembly directive to ensure WRF personnel are notified to assemble.

3.6 Support the Emergency Coordinator with post-Assembly activities.

3.7 For Accountability, perform the following actions.

3.7.1 Ensure that the Emergency Coordinator receives a detailed Accountability report within 30 minutes following the request.

3.7.2 Using the Unit Evacuation System and/or the site-wide page, locate any unaccounted individuals identified on the detailed Accountability Report.

3.7.3 If necessary, coordinate with Fire Protection personnel to locate and assist unaccounted individuals identified on the detailed Accountability Report.

4.0 Assembly Area Supervision actions

4.1 Ensure assembling personnel each register their ACAD in the card reader.

4.2 If the ACAD card reader is inoperable, perform the following actions:

4.2.1 Direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms).

4.2.2 Collect all forms and transmit them by facsimile (FAX 2687) to Security supervision.

4.3 If essential personnel are dispatched from an Assembly Area prior to completion of Accountability, account for them via one of the following methods (preferred listed first):

4.3.1 Transmit a copy of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), by facsimile (FAX) to Security supervision.

4.3.2 Notify Security supervision by telephone (6470 / 6471 / 6472) of name and ACAD numbers for the appropriate individuals as listed on an Accountability Form.

4.4 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

Appendix J - Site Evacuation

1.0 General information

1.1 Although Site Evacuation is required at the General Emergency level, it is an option for the Emergency Coordinator to determine the need for and order a site evacuation of non-essential personnel at a less severe classification level. The Emergency Coordinator may also direct sheltering or an early dismissal of personnel prior to a danger of radiation exposure.

1.2 Personnel who are not identified as Emergency Response Organization staff members are considered non-essential. This excludes onsite and offsite assistance personnel who are currently engaged in emergency response activities in direct support of the Emergency Response Organization.

1.3 It is imperative that onsite organization efforts associated with the evacuation are completed prior to notification of all non-essential personnel by the Emergency Coordinator of the need to evacuate the site. Security personnel must be strategically located to effect an orderly evacuation. A disorderly evacuation could increase the potential for personal injury and site security efforts should be coordinated with local law enforcement agencies to lower this potential.

1.4 Buckeye Airport is the preferred reassembly area due to additional radiological support provided by the Arizona Radiation Regulatory Agency and additional security support provided by local law enforcement agencies.

2.0 Emergency Coordinator actions

2.1 After actions to organize the evacuation have been completed and security measures have been established, transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. Site evacuation for non-essential personnel is required. Proceed to your own vehicles and follow the instructions from Security."

2.1.1 Sound the Site Evacuation Signal for approximately 30 seconds.

2.1.2 Repeat the message once. This responsibility can be delegated.

3.0 Radiation Protection Monitor / Radiological Assessment Coordinator actions

3.1 Consult with the Security Director / Security Coordinator to determine the evacuation route and site egress point.

3.2 Designate one or more radiological monitoring team(s) who will go to the Reassembly Area at Buckeye Airport to provide monitoring of personnel and vehicles.

3.3 In conjunction with the Security Director / Security Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

3.3.1 After the briefing, direct the radiological monitoring team(s) to take the following actions:

3.3.1.1 Obtain a copy of EPIP-06, Reassembly Area Operations.

3.3.1.2 Obtain two to four friskers (RM-20).

3.3.1.3 Obtain one to two dose rate instruments.

3.3.1.4 Obtain one two-way radio.

3.3.1.5 Obtain the Reassembly Area key.

3.3.1.6 Proceed immediately to the Reassembly Area at the Buckeye Airport using the appropriate site egress and evacuation routes.

NOTE

EPIP-06, Reassembly Area Operations, is designed to prepare the Reassembly Area for use in accordance with the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure. It should be utilized only for the time period prior to the arrival of state officials. Thereafter, the State of Arizona Standard Operating Procedure will be used to direct Reassembly Area Operations.

3.3.1.7 Upon arrival at the Reassembly Area, implement EPIP-06, Reassembly Area Operations, and transition to the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure upon arrival of state officials.

4.0 Security Director / Security Coordinator actions

4.1 Consult with the Radiation Protection Monitor / Radiological Assessment Coordinator to determine the evacuation route and site egress point.

4.2 The Security Director will complete supplemental onsite notifications prior to the Site Evacuation.

4.3 Inform Security supervision of the site egress and evacuation routes selected. Direct Security supervision to take the following actions and to report when completed.

4.3.1 Instruct a Security Officer to perform the following actions:

4.3.1.1 Obtain the emergency equipment for a Site Evacuation from Security Headquarters.

4.3.1.2 Prepare a selected Security vehicle (Security Shift Van preferred) with the emergency equipment.

4.3.1.3 Assume a strategic location at the designated site egress point.

4.3.1.4 Report when in position at the egress point.

4.3.1.5 Advise the CAS / SAS of status upon arrival at the Reassembly Area.

4.3.2 As determined by existing radiological conditions, direct Members of the Security Force to establish security measures and traffic flow requirements using personnel appropriately.

4.3.3 Advise local law enforcement agencies of the designated site egress point, the selected evacuation route, and the destination.

4.3.4 Contact the Water Reclamation Facility Control Room at Extension 3007 and inform the WRF Shift Supervisor of the need to evacuate the site, the designated site egress point, and to direct his / her personnel to load their vehicles to capacity and form a single line behind the lead Security vehicle at the designated site egress point.

4.4 In conjunction with the Radiation Protection Monitor / Radiological Assessment Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

4.4.1 Direct the Reassembly Team Leader(s) to obtain emergency van key boxes for vans located in the Operations and North Annex parking lots from the Emergency Operations Facility Activation Room. The keys are to be dispensed only to those personnel requiring van keys.

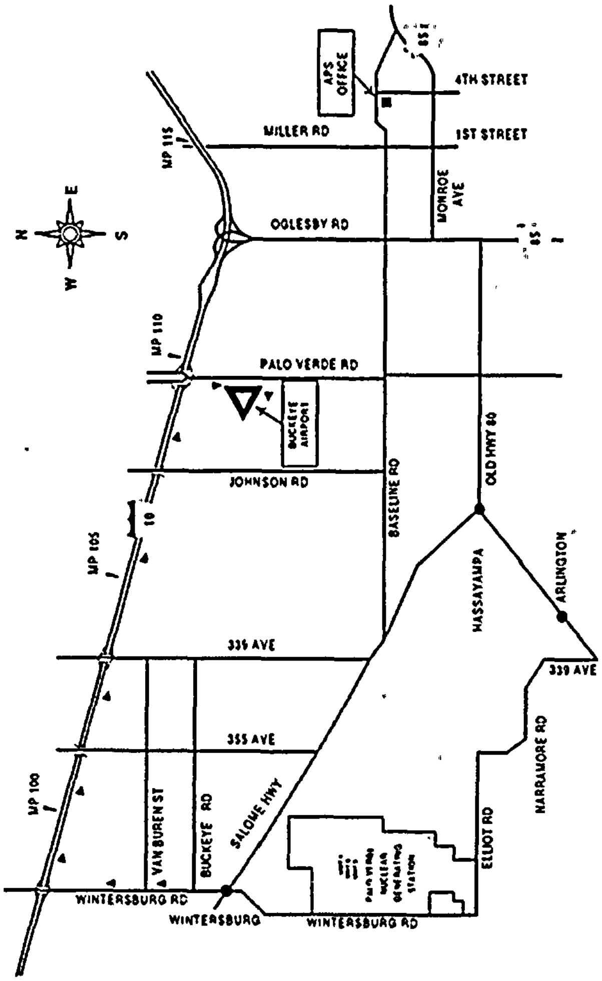
4.4.2 Direct the Reassembly Team Leader(s) to meet with the lead Security vehicle at the site egress point selected.

4.4.3 Direct the lead Security vehicle driver that when automobile and van drivers have formed a single line behind the lead Security vehicle at the designated site egress point, to proceed to the Buckeye Airport using the preselected evacuation route. Local law enforcement agencies will aid in the evacuation process, if required.

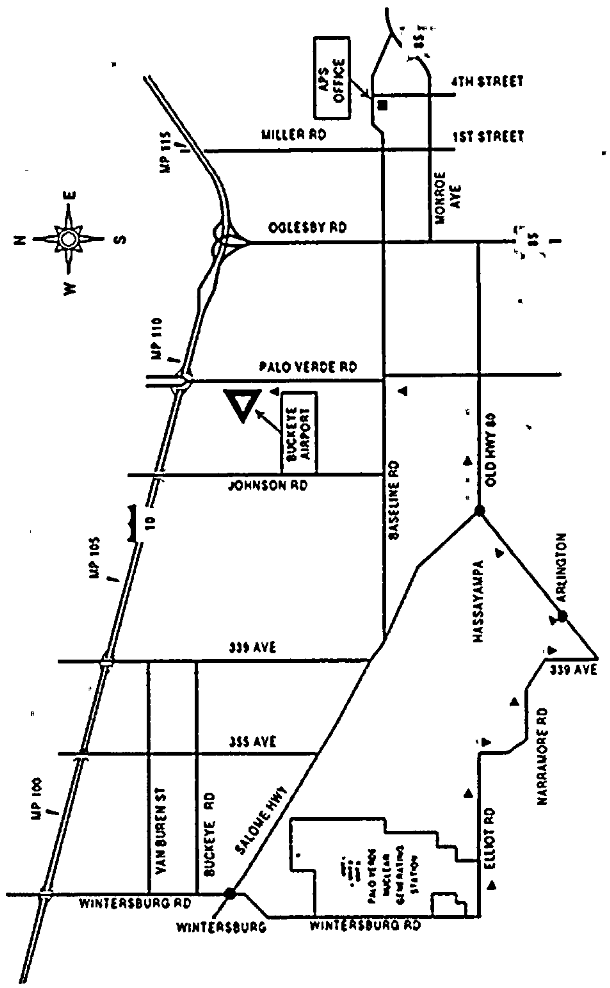
4.5 When the site has been evacuated, direct Security supervision to conduct searches of all buildings and areas outside the Protected Area for non-essential personnel.

5.0 Site Evacuation routes

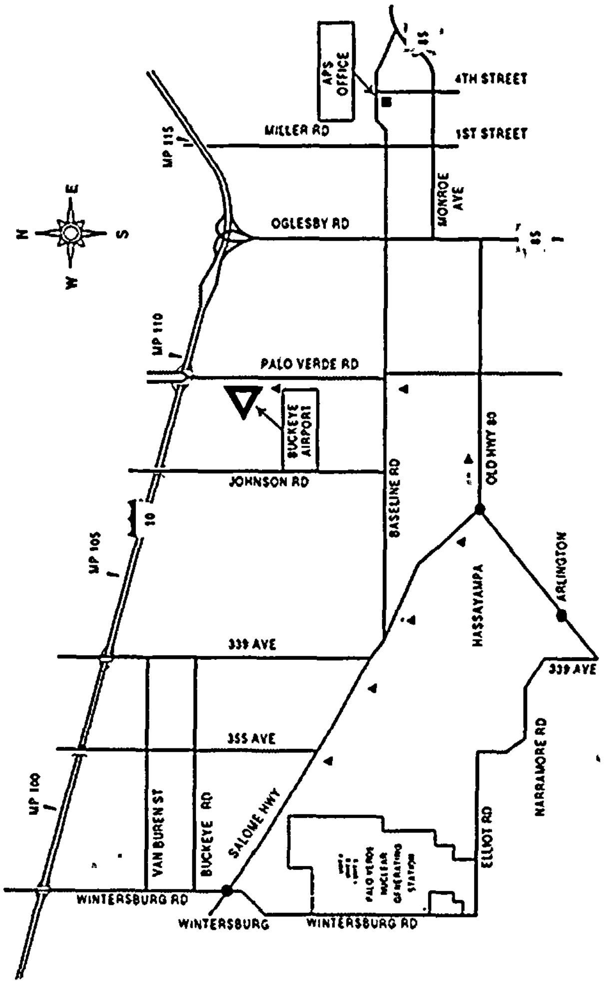
Site Evacution route #1



Site Evacuation route #2



Site Evacuation route #3



Appendix K - Emergency Exposures and KI

1.0 Introduction

1.1 Content

1.1.1 Planned Special Exposures, as defined in 10 CFR 20.1003 and 10 CFR 20.1206, are specifically excluded from guidance provided herein.

1.1.2 The instructions provided in this document assume that time is available for performing the appropriate sections. When circumstances dictate immediate actions, documentation associated with preliminary actions must be completed as soon as possible following those actions.

1.2 Noteworthy items

1.2.1 The Radiation Protection Monitor / Radiological Protection Coordinator shall advise the Emergency Coordinator on exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.2 The Emergency Coordinator shall authorize radiation exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.3 The Emergency Coordinator shall authorize use of Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM.

1.2.4 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be volunteers working under direct authorization of the Emergency Coordinator.

1.2.5 Emergency exposures associated with life-saving actions shall be limited to a single occurrence per lifetime.

1.2.6 Volunteers 45 years of age or older should receive primary consideration. When possible, the radiation exposure history of a volunteer should be researched and inspected prior to authorization. Minors are specifically excluded as volunteers.

1.2.7 Females shall not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

1.2.8 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be briefed, if time permits, on hazards and potential consequences prior to performing activities associated with that authorization. In cases when immediate actions are required, verbal authorization may be granted provided that all documentation associated with the authorization is completed as soon as possible following the actions. In all cases, subsequent dose extensions will not be granted prior to completion of evaluation documentation associated with preceding dose extensions.

1.2.9 Minimum documentation required for individuals authorized to receive dose not subject to the 10 CFR 20.1201(a) limits shall include an appropriate Radiation Exposure Permit and a completed Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms). Minimum authorizing documentation for use of KI shall be a completed Form EP-0503, KI Distribution (see Appendix C - Forms).

1.2.10 Administrative methods to minimize personnel exposure (ALARA) should remain in force to the extent consistent with timely rescue and corrective / protective actions per appropriate Radiation Protection Procedures.

1.2.11 Follow-up monitoring of individuals issued KI must be performed (whether or not exposure to radioiodine occurred) due to possible side effects associated with KI. In cases where radioiodine exposure has been confirmed, monitoring is required to maintain the thyroid blocking action by additional KI doses.

1.2.12 All dose received, including dose not subject to (beyond) 10 CFR 20.1201(a) occupational dose limits, will need to be subsequently documented in accordance with 10 CFR 20.2106.

1.2.13 Compliance with 10 CFR 20 during emergencies, including 10 CFR 20.1201(a) dose limits, shall occur as standard practice. Emergency related evolutions shall have a specific purpose involving high-priority actions necessary to save life, protect workers or the public, limit radiological release, or place the plant in a more secure condition relating to the emergency (protecting the plant).

1.3 Discussion

1.3.1 This document provides for personnel dose exposure control only under emergency conditions. For non-emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, should be used. During declared emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, remains applicable with the following provisions:

1.3.2 The current PVNGS Administrative Exposure Hold Point RRACS values established for site personnel will remain valid and the system will be used as a dose control tool for all activities in all Units and in all facilities.

1.3.3 The Radiation Protection Monitor, Radiological Protection Coordinator, or Radiological Assessment Coordinator may verbally authorize higher PVNGS Administrative Exposure Hold Points up to the 10 CFR 20.1201(a) limits for any particular emergency response team members. Use of Appendix A, Request for a Higher Administrative Hold Point, of Procedure 75AC-9RP01, Radiation Exposure and Access Control, during a declared emergency condition will not specifically be required.

1.3.4 Whereas the 10 CFR 20 limits apply to non-emergency conditions, every effort will be made to observe these limits under emergency conditions. They may be exceeded, if necessary, on a case-by-case basis, but only with advance authorization.

1.3.5 The Emergency Coordinator must authorize any dose beyond those limits specified in 10 CFR 20.1201(a) when the dose is projected to be in excess of any of those limits.

1.3.6 Emergency situations may include corrective / protective action circumstances where a high exposure to several individuals may greatly reduce exposure to many. A life-saving situation could also incur exposure approaching lethal levels when attempted. However, the vast majority of emergency response activity may be accomplished well within normal radiation dose controls.

1.3.7 Reflecting on this concept, the Environmental Protection Agency's (EPA's) guidance specifies that in the absence of special situations (e.g., life-saving, etc.), the 10 CFR 20 limits should be followed. An activity to protect valuable property is limited to 10 REM when a lower projected dose is not practicable. Life-saving activities on a voluntary basis have no upper limit established, but are not performed without the appropriate conditions applied.

1.3.8. Palo Verde Nuclear Generating Station has adopted this EPA guidance for emergency workers.

2.0 Emergency Exposure Dose Limits

2.1 Notes

2.1.1 The RPM / RPC may authorize doses up to the 10 CFR 20 limits - the EC must authorize doses beyond the 10 CFR 20 limits.

2.1.2 "Protecting Valuable Property" includes equipment-saving measures as well as sampling, surveillance, or repair activities that, in the opinion of the Emergency Coordinator, constitutes plant protective measures.

2.1.3 The exposure that workers incur for the protection of large populations may be considered justified for situations in which the collective dose avoided by the emergency operation(s) is significantly larger than that incurred by the workers involved.

2.2 Dose Limit Determination

2.2.1 Use the following chart to determine dose limits for which authorization of dose extensions may be required:

DOSE LIMITS	TEDE	TODE	LDE	SDE	AUTHORIZATION REQUIRED BY:
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM per year	50 REM * per year	15 REM per year	50 REM per year	RPM / RPC up to these limits EC to go beyond these limits
EPA Guidance for Protecting Valuable Property	10 REM per event	100 REM per event	30 REM per event	100 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations	≤ 25 REM per event	≤ 250 REM per event	≤ 75 REM per event	≤ 250 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM per event	> 250 REM per event	> 75 REM per event	> 250 REM per event	EC only *(and a risk discusion must be conducted)*

* Sum of Deep Dose Equivalent and Committed Dose Equivalent (DDE + CDE). ·EPA does not use TODE (Total Organ Dose Equivalent); EPA uses CDE in this column. PVNGS assesses TODE and, via this Instructional Guide and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

3.0 Thyroid CDE Risk Assessment

3.1 Outline

3.1.1 Use of this section assumes that conditions exist such that the probability for significant Iodine exposure is high. This section must initially be completed for each team and subsequently repeated for each team as conditions change. The sequence for radioiodine risk assessment will encompass the following actions:

1. Making a determination if the team's activity will be an Iodine concern
2. Determining Thyroid CDE dose rates for the team's work area
3. Performing a risk assessment for each team

3.2 Determining if Iodine is a concern.

3.2.1 Review internal plant conditions, component failure or leak areas, and external plume path conditions.

3.2.2 Instruct survey team(s) to obtain air samples in projected work areas and report the results of direct frisk readings on the particulate and Iodine media, in accordance with Form EP-0484, Air Sample Data (see Appendix C - Forms).

NOTE

The "µCi/cc" Iodine RMS channel indications on the RMS DCU or on ERFDADS cannot be used in the Field Sample Data Assessment for estimating Thyroid CDE rates. They represent accumulated, rather than current, airborne activity.

3.2.3 Review any alarming Radiation Monitoring System particulate, Iodine, and gas channels for indications of areas where other Iodine samples should be obtained.

3.2.4 For release path activity, collect appropriate particulate and Iodine samples, as necessary, from RMS Skids for counting on a multi-channel analyzer. If the sample volume is known, "µCi/cc" values may be obtained. Contact the Radiological Monitoring Technician as required.

3.3 Determining Thyroid CDE dose rates.

NOTE

A Thyroid CDE Dose Rate Estimate can be determined by using either the MESOREM printed report or field samples. The MESOREM printed report will provide recommendations to administer KI in affected sectors if the projected Thyroid CDE dose at the Site Boundary for the duration of the projected release time is > 25 REM. Additional Thyroid CDE dose rates will be provided for 2, 5, and 10-mile centerline distances. Field samples will provide more reliable data which can be used for the dose rate determination. For this reason, field samples are preferred when time is available.

3.3.1 For rate estimates using the MESOREM printed report, perform the following:

3.3.1.1 Review the 2, 5, and 10-mile Thyroid CDE dose rates and evaluate the dose where ARRA and RFAT Teams are expected to be operating. Since time is required for review and approval of data by the RAC, this process may not be applicable to the RPM.

3.3.1.2 For onsite receptors, review the "MAX" Thyroid CDE Dose Rate, which is calculated for a distance of 0.25 miles from the release point.

NOTE

The following applies to readings taken on Silver Zeolite (AgX) cartridges: On-scale frisker readings result in no requirement to administer KI. Full-scale frisker readings, i.e., 500,000 cpm, correlate to 1.6E-05 µCi/cc activity, which corresponds to slightly under 21 REM / hour. A frisker reading of 625 cpm correlates to the DAC limit of 2.0E-08 µCi/cc. On-scale RO-2 (closed window) readings of 3 mrem / hour at 1 hour into the event (after reactor scram) correlate to 6.0E-06 µCi/cc I131 equivalent, corresponding to approximately 8 REM Thyroid CDE / hour.

3.3.2 For rate estimates using field sample data, perform the following:

3.3.2.1 Obtain the I131 equivalent µCi/cc values from field team personnel. As time permits, obtain isotopic analysis results of the samples.

3.3.2.2 Direct the field teams to obtain additional samples needed to back-calculate and update dose projections until agreements in data are reached between projections and field samples. Data obtained via this process may be used for locations where no data is available.

3.3.2.3 Using the data obtained from onsite / offsite field samples, determine the Thyroid CDE dose / dose rates by multiplying the Iodine concentration from the Air Sample Data form (as reported by the field team) by 1.3E+06. The result is the equivalent Thyroid CDE dose rate in REM / hour. This calculation may also be executed on Form EP-0481, Air Sample Data (see Appendix C - Forms).

3.3.3 Determine the most accurate Thyroid CDE dose rate estimate from the review of all available data.

3.4 Performing a Team Risk Assessment.

NOTE

This process requires frequent performance during an emergency event when workers may be exposed to Iodine activity. Log entries should be used as documentation for the ongoing review process. Assessments should be as accurate as possible without resulting in over-conservative measures.

3.4.1 Determine the estimated stay time for the individual / team in the Iodine environment.

3.4.2 Select the most appropriate Thyroid CDE dose rate per the available data for the Iodine environment which will be entered.

3.4.3 Multiply the Thyroid CDE dose / hour by the estimated stay-time (in hours) to derive the estimated dose without application of protection factors.

3.4.4 Determine applicable protection factors of the protective equipment that will be used.

3.4.5 If the protection factors can be used to compensate for protective equipment, correct the estimated dose for the appropriate protection factor.

NOTE

Risk from a thyroid dose > 25 REM CDE warrants dispensation of KI.

3.4.6 If the net estimated dose is clearly < 25 REM Thyroid CDE, no further action is required.

3.4.7 If the net estimated dose is near or > 25 REM Thyroid CDE, proceed to Section 5 of this document, Potassium Iodide Administration.

3.4.8 Ensure the individual / team is appropriately briefed per Section 6 of this document, Team Briefing and Deployment.

4.0 **Emergency Exposure Authorization**

4.1 Preparing the authorization.

NOTE

This section requires documentation based on a review of the radiological evaluation of the situation requiring potential emergency exposure.

4.1.1 Perform a radiological evaluation of the situation that requires potential emergency exposure.

4.1.2 When the radiological evaluation has been reviewed, retrieve Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

4.1.3 On Form EP-0300 (see Appendix C - Forms), the ORIGINATOR Section shall be completed by the RPM / RPC (or staff), adhering to the following guidelines:

4.1.3.1 Team personnel are volunteers working under direct authorization of the Emergency Coordinator.

4.1.3.2 Females will not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

4.1.3.3 Personnel have been made aware of potential hazards associated with exposure received under emergency conditions.

4.1.3.4 The individual current exposure status of each team member has been (will be) examined and is (will be) known.

4.1.3.5 Volunteers 45 years of age or older have been given primary consideration.

4.1.3.6 Emergency exposures associated with life-saving actions will be limited to a single occurrence per lifetime.

4.1.3.7 Team members consist of the most qualified individuals.

4.1.4 On Form EP-0300 (see Appendix C - Forms), indicate clearly in the "Reason for Request" area that an Emergency Classification has been declared and add the reason for team entry.

NOTE

On Form EP-0300 (see Appendix C - Forms), all signatures designate acceptance of the necessity to conduct a risk discussion, as time permits, with all workers authorized dose extensions for life-saving efforts, i.e., those pertaining to the lower two categories of the Emergency Exposure Dose Limit Chart in Section 2.2 of this Appendix. The review will encompass the risk review data from Section 6.1 of this Appendix.

4.1.5 The Radiation Worker shall sign on the appropriate line(s) in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms).

4.1.6 The RPM / RPC shall sign on the appropriate line in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms) and attach to the form any documentation of radiation surveys, etc. (if time permits) which were used for the radiological evaluation previously completed.

NOTE

The Emergency Coordinator has sole authority to approve radiation exposures beyond the 10 CFR 20 radiation exposure limits up to the Emergency Exposure Limits specified in Section 2.2 of this document.

4.1.7 If deemed appropriate, the Emergency Coordinator will approve (authorize) the request for the limit(s) desired per the Emergency Exposure Dose Limits specified in step 2.2 of this document.

4.1.8 The RPM / RPC shall follow up on emergency exposure for each individual per section 7.1.

5.0 Potassium Iodide Administration

5.1 Dispensation of KI.

NOTE

For the most effective utilization, KI should be administered at least one-half hour prior to anticipated Iodine exposure. However, KI will maintain substantial benefit even when taken three or four hours following acute Iodine exposure.

5.1.1 Obtain required approval for KI administration from the EC.

5.1.2 Ensure that the Emergency Exposure Authorization has been completed. TEDE and TODE limits and required approvals for exceeding dose limits must be established coincident with approval for the administration of KI.

5.1.3 Initiate documentation for each individual authorized KI administration by using one Form EP-0503, KI Distribution (see Appendix C - Forms), for each worker. Though not mandatory, record individuals' HPID Numbers and dates-of-birth on the forms.

5.1.4 If verbal approval is necessary, annotate "per telecon by (your name)" and sign the form as indicated.

5.1.5 Ensure a team briefing on the possible side-effects of Potassium Iodide, i.e., summarization of information on Form EP-0503 (see Appendix C - Forms), is conducted prior to the administration of KI to these individuals.

5.1.6 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one tablet to each individual authorized KI. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

5.1.7 The RPM / RPC shall follow up on KI administration for each individual per section 7.1.

6.0 Team Briefing and Deployment

6.1 Risk discussion criteria

6.1.1 Review the following information with all personnel who have been authorized emergency exposures in excess of 25 REM:

RISK REVIEW INFORMATION

Health Effects Associated with Whole Body Absorbed Dose Received Within a Few Hours	Whole Body Absorbed Dose *(RAD)*	Early Fatalities *(percent)* 2	Whole Body Absorbed Dose *(RAD)*	Prodromal Effects *(percent affected)* 3
(see EPA-400 Appendix B) 1	140	5	50	2
	200	15	100	15
	300	50	150	50
	400	85	200	85
	460	95	250	98

1 Risks will be lower for protracted exposure periods.
2 Supportive medical treatment may increase the dose at which these frequencies occur by approximately 50 percent.
3 Forewarning symptoms of more serious health effects associated with large doses of radiation.

Approximate Cancer Risk to Average Individuals from 25 REM Effective Dose Equivalent Delivered Promptly	Age at Exposure *(years)*	Approximate Risk of Premature Death *(deaths per 1000 persons exposed)*	Average Years of Life Lost if Premature Death Occurs *(years)*
(see EPA-400 Appendix C)	20 to 30	9.1	24
	30 to 40	7.2	19
	40 to 50	5.3	15
	50 to 60	3.5	11

Threshold Dose Levels for Acute Doses

	Effect	Threshold Organ Dose
The threshold effect is a concept for defining a minimum acute organ dose above which the described effect will *(not may)* occur in the exposed individual, although the occurrence may come later. It is not a risk estimate. It is a minimum level of detectability from a limited number of observations, so threshold values for humans are approximate values -- not absolute numbers.	Suppressed Sperm Coun	10 REM
	Damage to Fetus	10 REM *(but high risk of mental retardation requires use of a lower limit)*
	Thyroid Function Impaired	200 RAD
	Thyroid Made Hypothyroid	3,000 - 10,000 RAD
	Cataracts	500 - 1,200 RAD
	Skin Reddening	300 - 800 RAD
	Skin with Oozing Lesions	1,200 - 2,000 RAD

Organ systems are not expected to show symptoms of severe clinical pathophysiology for acute doses below a few hundred RAD. For additional information, see EPA-400 Appendix B.

6.2 Dispatching the team.

6.2.1 Inform the team leader(s) that dose authorization approvals are complete

6.2.2 Ensure that Radiation Protection personnel have a clear understanding on established dose limits and team entry abort points.

6.2.3 Dispatch the team.

NOTE

If the computerized dose tracking system (RRACS) is inoperable, dose records must be updated manually and annotated in the DOSIMETRY RECORD UPDATE Section of Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

6.3 Request the RPM / RPC / RAC to update RRACS. (This action may be completed during or after the entry). If Dosimetry personnel are not available, obtain the sealed "Emergency Dose Authorization Package" from an Operations Support Center Emergency Kit. Open the envelope and follow the instructions inside, using the supplied RRACS password to gain access to the system and update the hold point with the new authorized limit.

7.0 Subsequent Actions

7.1 Emergency exposure follow-up

7.1.1 Upon return of team members, collect all dosimetry for evaluation.

7.1.2 Ensure all team members are not deployed for further work until exposure evaluations have been completed.

7.1.3 Retrieve Appendix B, Record Exposure Evaluation, of Procedure 75RP-9ME23, Lost or Damaged Dosimetry, and initiate actions to complete the form.

7.1.4 Transmit all thermoluminescent dosimetry (TLDs) to Dosimetry for evaluation. Include information regarding which individuals require expedited dose reports.

7.1.5 During RRACS record update, ensure appropriate dose limits are reset to normal levels. Dosimetry personnel will complete the RECORDS UPDATE Section of the Record Exposure Evaluation Form.

7.1.6 Conduct a team debriefing at the conclusion of the job evolution and when exposure evaluations have been initiated.

7.1.7 Report any exposures authorized by the EC and received by team members to the Emergency Coordinator / Emergency Operations Director.

7.1.8 Ensure that the EC initiates actions to complete USNRC notifications of radiation exposures per 75AC-9RP04, Radiological Reports, if appropriate.

7.2 KI administration follow-up

NOTE

Performance of this section assumes personnel from Dosimetry, Medical, and Radiation Protection are available for support efforts.

7.2.1 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one (1) tablet to each individual authorized KI every 24-hours for three (3) days. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

7.2.2 Consult the Medical Department and determine if the need exists for extended KI administration periods by evaluating radiological exposures. In unusual circumstances, KI may be issued for a period of up to ten days. The Medical Department will provide KI dispensing instructions and will supervise KI administration.

7.2.3 Continue the monitoring of personnel for side-effects to KI and/or any radioiodine exposures that may have occurred.

7.2.4 When required documentation on each Form EP-0503, KI Distribution (see Appendix C - Forms), has been completed, forward the completed forms to Dosimetry. These forms become part of each individual's exposure history.

Appendix L - Accident Sampling

1.0 Introduction

1.1 Applicability

This Appendix is applicable to obtaining, handling, analyzing, and reporting samples pertaining to accident conditions in accordance with the requirements specified in NUREG-0654 and NUREG-0737. It provides the methodology for analysis of reactor coolant liquid, safety injection liquid, and Containment atmosphere samples. In addition, the document functions to provide instructions for RMS effluent sampling from the Plant Vent and Fuel Building Exhaust high range monitors for particulate and Iodine activity. Chemistry will usually be responsible for performance of this procedure with assistance from Operations and Radiation Protection personnel.

1.2 Prerequisites

Direction has been authorized and received for initiating the actions necessary to obtain accident sampling and analysis.

1.3 Precautions - general

1.3.1 Sampling activities require review of current and potential radiation and airborne activity to determine if actions associated with emergency exposures or issuance of KI need to be implemented.

1.3.2 When practical, the use of remote tools and shielding to minimize radiation exposure should be accomplished.

1.3.3 Monitoring for explosive atmospheres should be performed whenever plant, fuel, or sampling conditions indicate actual or potential elevated Hydrogen levels.

1.3.4 If possible, the sample should be counted in an Affected Unit laboratory. An Unaffected Unit laboratory should be prepared for analysis if conditions preclude counting in the Affected Unit laboratory.

1.3.5 Samples acquired during and after accident conditions should not be disposed of or destroyed without prior approval of the Chemistry Coordinator or the Emergency Coordinator.

1.4 Precautions - PASS inoperable

1.4.1 74DP-9CY02, Post-Accident Sampling System Program, provides direction for alternate sampling capability in the event that PASS becomes inoperable. Further direction is contained in 74OP-9SS05, Preplanned Alternate Sampling, which provides specific alternate sampling and collection methodology. The guidance in these procedures should be used in conjunction with this document for sample handling, control, and analysis.

1.4.2 When using the Preplanned Alternate Sampling methodology, dose rates and airborne activity will vary considerably, depending on plant conditions.

1.4.3 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, is based on using a PASS which is operable. The calculation assumes the CEDE dose to be negligible relative to the DDE.

1.4.4 Calculated data is not provided for specific Preplanned Sampling events beyond the data developed for PASS sampling for the following reasons:

1.4.4.1 In a Loss-of-Power (LOP) condition, the potential for localized airborne hot spots is high because ventilation / filtration will not be operating. The natural ventilation flows and flow paths resulting will be unpredictable.

1.4.4.2 Under abnormal plant conditions in which PASS is not operable, travel paths to and from sample areas, stay times in those areas, and plant conditions could vary widely from the projected calculated data comprising Section 9.0 of this document.

1.4.4.3 Use of supplied air, Self-contained Breathing Apparatus (SCBA), and/or other use of respiratory protection will most likely be required under accident conditions, as implementation of the procedure indicates significant plant conditions exist. The CEDE dose component may be crucial.

1.5 Precautions - RMS skid and sampling activity

1.5.1 Due to the potential for fluctuating area and release stack dose rates under accident conditions, the Chemistry and Radiological Monitoring Technician must maintain the Radiation Protection Monitor and Operations Support Center staff aware of their work areas and expected stay times to allow for dose control.

1.5.2 Dose rates and/or conditions may preclude accomplishing scheduled tasks. These conflicts should be brought to the attention of the Emergency Coordinator and Chemistry Coordinator for resolution.

1.6 Precautions for Chemistry Technician / Radiological Monitoring Technician

1.6.1 Sampling activities under emergency conditions prior to activation of onsite facilities will be authorized by the Onshift Organization - sampling activities under emergency conditions following activation of onsite facilities will be authorized by the Onsite Organization.

1.6.2 Prior to sampling work activities, all applicable technicians must sign the Emergency Radiation Exposure Permit and participate in a briefing conducted by Operations Support Center staff on current and expected conditions.

1.6.3 A working area telephone number should be provided to the Operations Support Center Coordinator and to the Chemistry Coordinator in the Technical Support Center. Available FAX machines may be utilized for additional communications with Technical Support Center staff.

1.6.4 During sampling activities, the Chemistry and/or Radiological Monitoring Technician should provide verbal updates to the Radiation Protection Technician, concentrating on actions which may cause a change in radiation levels.

1.6.5 Consider raising the alarm setpoints on RU-23, RU-26, and/or RU-158D commensurate with expected area dose rates. Consider isolating the taps on RU-9 and RU-10 to obtain representative sampling of a particular area, i.e., isolating RU-10 to monitor only the Chemistry Hot Lab area during sampling.

1.6.6 Verify the current operability of the sampling area ventilation system.

1.7 Precautions for Radiation Protection Technician

1.7.1 A determination must be made regarding protective equipment and area entry requirements prior to commencement of any sampling work. As soon as personnel are identified, extremity thermoluminescent dosimetry (TLD) packets should be prepared to avoid any delays in the sampling evolution.

1.7.2 Critical steps in the procedure should be reviewed with assigned personnel and expected stay times, sample exposure times, and critical areas should be determined. Expected exposures should be ascertained when reviewing available survey data, plant conditions, and RMS indications. Additional surveys should be obtained, if necessary. An RO-7 can be used to monitor dose rate changes in front of septum ports in extreme dose conditions.

1.7.3 Exposure limits, dose extensions, Potassium Iodide administration, and approvals can be obtained from the Radiation Protection Monitor / Radiological Protection Coordinator. If necessary, process additional exposure authorizations and/or KI distribution documentation (see Appendix K - Emergency Exposures and KI, and contact the RP Monitor for guidance). Ensure all documentation, including RRACS entries, are complete prior to proceeding with sampling evolutions.

1.7.4 A Radiation Exposure Permit should be prepared for all assigned sampling activities. Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), will aid in assurance that radiological controls and directions are established.

1.7.5 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, and the Briefing Guidelines in section 2.0 should be reviewed with all team members prior to dispatch.

1.7.6 Ensure that all samples collected are labeled, stored, and posted in accordance with 75RP-9RP15, Control and Storage of Radioactive Material.

1.8 Precautions - Chemistry Leader / Chemistry Coordinator

NOTE

The Chemistry Coordinator will function from the Technical Support Center following that facility's activation. Prior to activation, direction and/or recom-mendations may be obtained via telecommunications from an offsite Chemistry Leader if specific Chemistry information and/or direction is necessary.

1.8.1 The Chemistry Leader / Chemistry Coordinator should ensure that all personnel assigned duties regarding sampling and analysis are qualified and experienced on system operations.

1.8.2 In coordination with the Emergency Coordinator and Shift Technical Advisor / Reactor Analyst, the Chemistry Leader and/or Chemistry Coordinator should determine the samples required and the sampling priorities for current plant conditions. Consideration of and,planning for RMS high range skid sampling options (3 P/I configurations are available), sampling per the Preplanned Alternate Sampling options, PASS sample options, and other RMS samples available should be included.

1.8.3 Analytical equipment required to analyze a post-accident sample should be prepared at an Alert, or higher, emergency classification, whether or not a post-accident sample has been requested. If radiation levels are prohibitive in the Affected Unit, preparations should be started in an Unaffected Unit.

1.8.4 Consideration should be given to allow at least 2 hours to elapse after a reactor trip prior to isolating a PASS RCS or Containment atmosphere sample:

1.8.4.1 2-hour decay could decrease local radiation levels by 2-2½ times

1.8.4.2 3-hour decay could decrease local radiation levels by up to 10 times

1.8.5 Containment and Auxiliary Building sump liquids may exhibit higher-than-normal radiation levels during accident conditions.

1.8.6 The Auxiliary Building sumps automatically pump to the TDS Tanks to prevent flooding and subsequent loss of the HPSI, LPSI, and CS Pumps. If RCS leakage to the Containment or Auxiliary Building sumps exists in conjunction with elevated RCS activity, monitoring and planning will be required for the extreme activity potential that can be transferred to the TDS Tank area outside of the Radwaste Building.

1.8.7 Safety Injection liquid samples can be used to estimate the Containment sump activity levels after a Recirculation Actuation Signal (RAS) has occurred or if the plant has been cooled down and Shutdown Cooling has been placed into service.

1.9 Precautions - Radiation Protection Monitor (RPM) / Radiological Protection Coordinator (RPC)

1.9.1 The RPM should direct, review, and monitor the actions of the Radiation Protection staff to ensure adequate pre-job surveys, REPs, and team briefings are provided for all sampling teams. The PASS Dose Information / Thumb Rules in section 9.0 and the Briefing Guidelines in section 2.0 of this Appendix should be used.

1.9.2 If exposures due to sampling activities are expected to approach or exceed those specified in 10 CFR 20.1201(a) or if high Iodine activity is potentially present, recommendations should be made to the Emergency Coordinator to implement guidance associated with Appendix K - Emergency Exposures and KI.

1.9.3 Communications between the Chemistry and Radiological Monitoring Technicians and the Operations staff should be maintained to ensure that changing plant conditions are understood and properly confirmed during all sampling activities. Any changes that occur to either monitored or unmonitored release pathways should be taken into account from an offsite perspective. Any changes that occur to onsite RCA boundaries due to internal and external dose limitations should also be considered as plant conditions change.

2.0 Sampling Briefing and Preparation

2.1 Briefing guidelines

The following Sampling Team Briefing Guidelines should be used when conducting the In-plant Team Briefing prior to sampling activities:

2.1.1 As a minimum, extremity dosimetry shall be placed on the middle finger of anyone handling sample tools or samples. Extremity dosimetry shall be utilized for Chemistry personnel working directly in front of septum ports on the Post-Accident Sampling System (PASS) or Radiological Monitoring (RM) Technicians collecting samples from Radiation Monitoring System (RMS) high range skids. Extremity dosimetry should be issued in accordance with site dosimetry procedures.

2.1.2 Due to the speed with which an accident sample is drawn, the RP Technician will probably not have sufficient time to collect an air sample and have it counted before the time at which the accident sample is drawn. Nor is there expected to be significant airborne activity released from the sample when using the PASS unit. Despite this assumption, an air sample should be prepared and run during the sampling activity to allow for the unexpected. RU-10 should be monitored constantly by the RM Technician. Preplanned Alternate Sampling activities will require additional actions based on implementation of section 7.0, Preplanned Alternate Sampling.

2.1.3 Proper labeling of samples with applicable times related to events will be crucial to the ongoing response to the emergency. All labeling activities should be performed from the long-term impact perspective. If extreme sample activity precludes labeling samples directly, the RP Technician shall ensure that outer postings are complete and that they provide direction for control of the samples.

2.1.4 The accident sampling team should thoroughly discuss each planned sample activity by stepping through this document and verbalizing the intent of each step and what is required to perform that step. Equipment should be verified available prior to starting actual sample collection. Plan for the unexpected; discuss what to do if a sample is dropped, a glass syringe breaks, etc. Any system breach will cause an immediate significant increase in Noble Gas activity.

2.1.5 The accident sampling team shall immediately inform the Operations Support Center Coordinator and the Chemistry Coordinator of significant problems or changes to the expected conditions as addressed in this briefing and on the REP.

2.1.6 The accident sampling team shall review the information comprising the PASS Dose Information / Thumb Rules in section 9.0 of this procedure, Sample Data Reference, prior to the start of sampling. All accident sampling team members shall also review current RMS indications. Preplanned Alternate Sampling teams shall employ continual RMS monitoring during all sampling evolutions.

2.1.7 When possible, use remote tools to handle high activity samples during sampling and analysis to provide maximum distance from the source. Maintain personnel exposures ALARA by observing all necessary precautions based on existing conditions.

2.1.8 The travel routes to and from the sample area should be reviewed to minimize dose. The route should be monitored for changes by OSC staff after an accident sampling team is dispatched.

2.1.9 Monitoring for an explosive atmosphere should be performed whenever plant / sampling / fuel conditions indicate elevated Hydrogen activity.

2.2 Preparing resources

NOTE

Emergency conditions may require immediate actions. If all actions outlined in the remainder of this Section cannot be completed prior to team dispatch, they may be completed in parallel with or as soon as possible following team dispatch.

2.2.1 When the team briefing has been completed and documented, ensure that all appropriate personnel data have been recorded on the applicable REP and have been entered into RRACS accordingly.

2.2.2 Ensure that all specified dosimetry and protective equipment has been issued.

2.2.3 Ensure that all RP pre-job surveys are complete and that preliminary postings are in place as required.

2.2.4 Ensure that the Chemistry, RP, and RM Technicians have each reviewed the actions in this document relative to critical hold points and that each has reviewed their planned sample survey and handling techniques in accordance with the Briefing Guidelines in section 2.0 and the PASS Dose Information / Thumb Rules specified in section 9.0 of this document.

2.2.5 Direct each accident sampling team member to perform an initial RMS review.

2.2.6 Instruct the RM Technician to monitor for unexpected changes on monitors near the sampling areas and near routes leading to and from the sampling areas.

NOTE

The choice of sampling method to be used is based on dose potential rather than on event categorization. Normal sampling systems may be employed under emergency conditions until or unless the dose potential mandates otherwise.

2.2.7 Based on sampling requirements, ensure that one of the following actions has occurred:

2.2.7.1 The Chemistry Technician has prepared either Chemistry Cart #1 or Chemistry Cart #2 for PASS sampling. Form EP-0051, Chemistry Cart #1 Preparation Checklist (see Appendix C - Forms), or Form EP-0052, Chemistry Cart #2 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.2 The Radiological Monitoring Technician has prepared Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.3 The Chemistry Technician has prepared equipment per the requirements specified in 74OP-9SS05, Preplanned Alternate Sampling (PASS is inoperable and PASP has been initiated.)

NOTE

Initially, two 1-inch attenuator blocks are used for the liquid and gas isotopic sample analyses. Initially, six 1-inch attenuator blocks are used for the particulate and Iodine sample analyses and the number of attenuator blocks are decreased, if necessary.

2.2.7.4 Verify that an efficiency calibration for necessary attenuators has been performed in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System, for each detector to be used. A PASS detector is any predefined detector which has been calibrated and verified using lead attenuators or collimators within 25% of certificate activity in accordance with 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.5 Verify that calibrations have been performed on the Multi-Channel Analyzer (MCA), Autotitrator, Ion Chromatograph, and Gas Chromatograph and that they meet the criteria specified in 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.6 If the Gas Chromatograph is to be used, ensure that the exhaust is directed to an operating vent fan.

3.0 PASS depressurized liquid sampling

3.1 Preparing for sample collection

3.1.1 Place the temporary syringe disposal shield inside the sample room.

3.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

NOTE

During sample recirculation, an increase in activity may be observed on RU-26, on RU-158 CH-4 (Chemistry Sample Room), and on RU-155 CH-3 (77' West Penetration Room). Samples in Units 2 and 3, with the exception of Containment atmosphere, recirculate coolant immediately from the 77' elevation West Penetration Room to the Chemistry Primary Sample Room. Containment atmosphere samples are first recirculated locally to the 77' elevation West Penetration Room and then are directed to the Chemistry Primary Sample Room in a recirculation phase. In Unit 1, all samples progress through local recirculation before they are directed to the Chemistry Primary Sample Room.

3.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Technician, and the OSC Coordinator that PASS is in sample recirculation.

3.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

3.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

3.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

3.1.6.1 Special concern should be placed on streaming from the septum ports, approximately 6 inches from the floor, and directly in front of the sample sink.

3.1.6.2 Ask the Chemistry Technician which septum port is appropriate prior to entering the sample room.

3.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing.

3.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document.

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 0.5 ml of sample.

Analysis to be Done	Volume Needed	IAW
Gamma Isotopic	0.1 ml	74CH-9XC50
B	0.3 ml	74CH-9ZZ06
Cl	0.1 ml	74CH-9ZZ72

3.1.6.5 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines.

- Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

3.1.6.6 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

3.1.6.7 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

3.1.6.8 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

3.2 Collecting the sample

NOTE

A 1-ml liquid syringe of primary coolant, collected 2 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 780 REM / minute contact, and will decrease to 80 REM / minute at 6 cm (2.4 inches).
The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

3.2.1 Using the equipment previously staged on Chemistry Carts #1 and #2, place a 3½-ml liquid vial into the 2-inch thick lead pig.

3.2.2 Position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

3.2.3 Using the remote tool, place the syringe into the liquid sample port guide tube assembly.

3.2.4 Quickly and carefully, withdraw the desired sample volume into the syringe.

3.2.5 Remove the syringe from the sample port and carefully dispense the entire volume into the 3½-ml vial contained in the lead pig.

3.2.6 Place the empty syringe into the temporary syringe disposal cask with the point of the needle down.

3.2.7 (The RP Technician shall) take the dose rate reading at the top of the vial prior to dilution. This reading will be used for subsequent dilution calculations.

3.2.8 Prepare one piece of parafilm measuring 2-inch by 2-inch. Do not remove the backing paper from the piece of parafilm.

3.2.9 Place the piece of parafilm with the backing paper facing down over the vial containing the sample.

3.2.10 Install and latch the lead pig lid and move to a low dose area, as required.

3.2.11 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0 of this document, Sample Transportation. Otherwise, continue in this Section.

3.2.12 Monitor the background dose from the cart when working on dilution activities for isotopic analysis to ensure that Chemistry Count Room operations are not affected.

3.2.13 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

3.2.14 Unlatch and remove the lid from the lead pig containing the sample.

3.2.15 Using two tongs approximately 10 inches long, remove the parafilm and paper backing from the top of the 3½-ml vial. Ensure that the vial is not pulled out of the lead pig by the parafilm.

3.2.16 Ensure that the sample vial remains within the shielded portion of the lead pig for the maximum possible time.

3.2.17 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

3.2.18 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

3.3 Preparing for sample analysis

3.3.1 Ensure that the modified lead brick containing three vials is on cart #1 with their vial lids removed.

3.3.2 Ensure that no other contributing dose rate source is on cart #1.

3.3.3 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

3.3.3.1 For Boron Analysis, go to section 3.4.

3.3.3.2 For Chloride Analysis, go to section 3.5.

3.3.3.3 For Gamma Isotopic Analysis, go to section 3.6.

3.3.3.4 For Oxygen Analysis, go to section 3.7.

3.3.4 Using a pipette, withdraw an appropriate volume of liquid for each analysis required from the sample vial contained in the lead pig.

3.4 Boron analysis

3.4.1 For Boron analysis, proceed to 74CH-9ZZ06, Boron Autotitrator Operation and Calibration, using an RP Technician to provide radiological controls and support coverage. Return to this step when completed.

3.4.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.5 Chloride analysis

3.5.1 For Chloride analysis, proceed to 74CH-9ZZ72, Operation and Calibration of the Ion Chromatograph, using an RP Technician to provide radiological controls and support coverage. (Return to this step when completed.)

3.5.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.6 Gamma isotopic analysis

3.6.1 Dispense each volume of sample into one of the 7-ml vials contained in the modified 3-stage lead brick. Identify each vial if more than one is to be used.

3.6.2 Move cart #2 to an area away from cart #1 to minimize the dose rate. Relocate cart #2 to an area which will not affect Count Room operations.

3.6.3 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

3.6.4 Using the following equation, calculate activity (A):

$$A = (RV / G) \times 1000$$

where:

A = total sample activity in mCi (milliCuries)

R = sample dose rate reading at the top of the vial in R/hr (obtained by RP Technician in the preceding step)

V = sample volume in ml (normally 0.1 ml)

G = applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0 of this document, Sample Data Reference

1000 = conversion factor from Ci to mCi

Calculated activity: ______________________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

3.6.5 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

3.6.6 After using pipettes to transfer the desired sample volume from one vial to another, use a 10-ml (B-D) syringe with a 1½-inch needle to dilute the sample to a total volume of 7 ml with D.I. water.

3.6.7 When the final dilution is complete, replace the screw cap on the vial to be counted and wrap the vial with parafilm, plastic wrap, or a plastic bag.

3.6.8 Prepare and attach clear identification information to the sample vial.

3.6.9 If dilutions were completed for the remaining dilution vials, cap them and attach clear identification information to them.

3.6.10 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

3.6.11 (The RP Technician will) record the dose rate reading(s) on a survey map and post / label the sample accordingly.

3.6.12 (The Chemistry Technician should) review the planned movement and use of the sample to allow the RP Technician to prepare the necessary area postings and contamination controls.

3.6.13 Place the 7-ml sample vial to be counted into a 1-inch lead carrying case and carry the sample to the sample counting room.

3.6.14 (The RP Technician will) post the Count Room area and prepare contamination controls as sample activity warrants.

3.6.15 (The Chemistry Technician should) review planned activities / work.

3.6.16 Using two 1-inch attenuator blocks for liquid isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per the PASS Liquid Sample Dilution Requirements in Section 9 of this document, Sample Data Reference.

3.6.17 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

3.6.18 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

3.6.19 Proceed to section 6.0, sample analysis follow-up.

3.7 Oxygen analysis

NOTE

Dissolved Oxygen for post-accident conditions will be determined by calculating the amount of Oxygen introduced into the system from either the borated water source (RWT) or the Containment atmosphere. Any Oxygen depletion due to Hydrogen scavenging or other means will be ignored. Henry's Law Constants were taken from EPRI, PWR Primary Water Chemistry Guidelines, Revision 2, and Lange's Handbook of Chemistry, 12th Edition. Oxygen (cc/kg) is converted to Oxygen (ppm) in the ratio: ppm (0.7) = cc/kg.

3.7.1 For Small Break LOCA (pre-RAS), perform the following:

Determine RCS Oxygen concentration (Cf) using the following equation:

$$\mathrm{Cf} = \left[\frac{\left[\frac{(\mathrm{Prwt}) \times 0.209 \times 1.43}{\mathrm{H}}\right] \times [\mathrm{Vrwt}] \times \mathrm{CI} \times \mathrm{VI}}{\mathrm{Vf}} \right]$$

where:

Cf = Final RCS oxygen concentration, ppm

Prwt = RWT pressure, psia

0.209 = Conversion factor for partial pressure of oxygen exerted on RWT (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

Vrwt = Volume of RWT added to system, gallons

CI = Initial concentration of RCS Oxygen, ppm

VI = Initial volume of RCS, gallons (maximum RCS volume = 100,000 gallons)

Vf = Final combined volume, gallons (maximum RCS volume = 100,000 gallons)

H = Henry's Law Constant, kg-psia/cc (from table below)

RWT Temperature (ºF)	kg-psia / cc
Trwt = 75	0.51
Trwt = 100	0.62
Trwt = 150	0.78
Trwt = 200	0.86

3.7.2 For Large Break LOCA (RAS), perform the following:

Determine RCS Oxygen concentration using the following equation:

$$Crcs = \left[\frac{Pctmt \times 0.209 \times 1.43}{H}\right]$$

where:

Crcs = Concentration of Oxygen in RCS (ppm)

Pctmt = Containment pressure, psia

0.209 = Conversion factor for partial pressure of Oxygen in Containment (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

H = Henry's Law Constant, kg-psia/cc (from table below)

RCS Temperature (ºF)	kg-psia / cc
T_{RCS} = 75	0.51
T_{RCS} = 100	0.62
T_{RCS} = 150	0.78
T_{RCS} = 200	0.86

4.0 PASS pressurized liquid (gas) / containment air sampling

4.1 Preparing for Sample Collection

4.1.1 Place the temporary syringe disposal shield inside the sample room.

4.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

4.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Tech-nician, and the OSC Coordinator that PASS is in sample recirculation.

4.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

4.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

4.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

4.1.6.1 Special concern should be placed on streaming from the septum ports located at the front of the sample sink approximately 6 inches from the floor and at the left side of the sample sink approximately 18 inches from the floor.

4.1.6.2 Ask the Chemistry Technician which septum port is appropriate for the intended sample prior to entering the sample room

4.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing

4.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 2 samples.

Analysis to be Done	Volume Needed
H2 / O2	0.5 cc
Gamma Isotopic	0.1 cc

4.1.7 (The Chemistry Technician shall) inform the RP Technician of the number and volume of samples required.

4.1.8 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines. Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

4.1.9 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

4.1.10 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

4.1.11 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

4.2 Collecting the sample

CAUTION

A 0.5 cc syringe of RCS gas, collected 3 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 330 REM / minute contact, and will decrease to 27 REM / minute at 6 cm (2.4 inches). The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

4.2.1 With the equipment previously staged on Chemistry Carts #1 and #2, position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

4.2.2 Insert the gas-tight syringe into the handling tool and adjust the tool to withdraw the desired amount.

4.2.3 Using the syringe handling tool, place the syringe into the port guide tube assembly and withdraw the desired sample volume into the syringe.

4.2.4 (The Chemistry Technician will) place the syringe handling tool containing the syringe on the sample cart and then retreat to a designated low dose area.

4.2.5 (The RP Technician shall) take the dose rate reading on the syringe to establish initial working conditions.

4.2.6 If the sample is to be transferred to an Unaffected Unit, (the Chemistry Technician will) lock the syringe using the remote syringe locking tool.

4.2.7 (The Chemistry Technician will) place the syringe handling tool containing the syringe in the syringe carrying case.

4.2.8 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

4.2.9 Relocate the sample cart with the sample to an area of known background readings for the required analysis. Ensure that the area selected will not affect Count Room operations due to an unshielded source.

4.2.10 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

4.2.11 Ensure that the sample remains shielded for the maximum possible time.

4.2.12 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

4.2.13 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

4.3 Preparing for sample analysis

4.3.1 Ensure that all analyses activities are performed in accordance with Chemistry procedures and that the RP Technician is available to provide radiological controls and coverage.

4.3.2 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

4.3.2.1 For Hydrogen and Oxygen Analyses, go to section 4.4.

4.3.2.2 For Gamma Isotopic Analysis, go to section 4.5.

4.4 Hydrogen and Oxygen analyses

4.4.1 For Hydrogen and Oxygen analyses, transport 0.5 cc of sample to the gas chromatograph and analyze the sample in accordance with 74CH-9XC40, Operation and Calibration of the Hewlett Packard Gas Chromatograph. Return to this step when completed.

4.4.2 Proceed to section 6.0, sample analysis follow-up.

4.5 Gamma Isotopic analysis

4.5.1 For Gamma Isotopic analysis, transport 0.1 cc of sample to the sample preparation area and dispense the sample volume into a 9.2 cc gas vial (the vial previously evacuated 0.1 cc) contained in the modified lead bricks. The sample is now shielded.

4.5.2 Dispose of the syringe into the syringe disposal cask, needle down.

4.5.3 Move cart #2 to an area away from cart #1 to minimize the working dose.

4.5.4 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

4.5.5 Using the following equation, calculate activity (A):

$$A = (RV / G) \times 1000$$

where:

A = Total sample activity in mCi (milliCuries)

R = Sample dose rate reading at the top of the vial in REM/hr (obtained by RP Technician in the preceding step)

V = Sample volume in ml (normally 0.1 ml)

G = Applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0, Sample Data Reference

1000 = Conversion factor from Ci to mCi

Calculated activity: ____________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

4.5.6 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

4.5.7 Perform the appropriate dilution by evacuating the specified amount from a clean 9.2 cc gas vial and injecting the sample.

4.5.8 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

4.5.9 (The RP Technician will) record the dose rate reading(s) and post / label the sample accordingly.

4.5.10 Place the final sample into a 1-inch shield and transport the sample to the sample counting room.

4.5.11 Using two 1-inch attenuator blocks for gas isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per section 9.0 of this document, Sample Data Reference.

4.5.12 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

4.5.13 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

4.5.14 Proceed to section 6.0 in this document, Sample Analysis Follow-up.

5.0 RU-144 / RU-146 High Range sampling

5.1 Preparing resources

5.1.1 "Mn" is the designator used for a Bechtel RU monitor number (e.g., Monitor-30 correlates to RU-144, Monitor-49 correlates to RU-146). "C" is the designator for the Channel Number or sample chamber, as appropriate.

5.1.2 RU-144 / RU-146 have two particulate / Iodine continuous (default) collection chambers and a third grab sample chamber, which has precisely timed collection capabilities. These are identified as 1, 2, and 3 from left to right when facing the chamber collection trays. The timed grab sample chamber is #3.

5.1.3 2 sample choices exist:

5.1.3.1 Either one of the two continuous channels may be collected after placing the alternate channel into operation, or...

5.1.3.2 A timed grab sample may be taken (low volume) in conditions of high Iodine activity

5.1.4 The instructions in this Section should be performed by the Radiological Monitoring Technician and pertain only to RU-144 and RU-146 particulate and Iodine samples. All other samples should be obtained in accordance with 74RM-9EF60, RMS Sample Collection.

5.1.5 Access to either monitor requires established radio communications with Technical Support Center personnel or with those designated per the team briefing. The RP Technician shall ensure that radio communications are maintained.

CAUTION

Exposure rates may be extremely high when attempting to obtain samples from an effluent monitor under accident conditions - both at the skid and enroute. All ingress / egress paths should be evaluated to minimize potential dose. The instructions herein may be performed out-of-sequence for ALARA considerations. Sample dose rates will be dependent on sample flow rates and Iodine activity levels. Form EP-0055, RMS Skid Collection Time Calculation (see Appendix C - Forms), may be used to determine the collection time in high Iodine activity situations to maintain sample dose rates below the 0.25 Ci sample counting limit.

5.1.6 (The RP Technician shall) ensure that the Radiological Protection Coordinator (RPC) in the Technical Support Center (TSC), or designee, will monitor plant and RMS conditions and provide them to the sampling team via radio, as appropriate.

5.1.7 Use Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as required, to log information accumulated during performance of these instructions.

NOTE

The filter head, a stainless steel head specifically designed for the RMS, and the required sample handling tools / tongs, are located in the OSC Emergency Kit.

5.1.8 Prepare all equipment associated with Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

5.1.9 If RU-146 sampling is to be performed, ensure that a bucket with at least 50' of rope is included with the equipment.

5.1.10 Load the filter head with a Silver Zeolite (AgX) Cartridge and particulate filter.

5.1.11 Determine the sample to prepare and proceed to the appropriate sample preparation block per the following:

5.1.11.1 To prepare a continuous collection sample from RU-144, go to section 5.2.

5.1.11.2 To prepare a timed grab sample from RU-144, go to section 5.3.

5.1.11.3 To prepare a continuous collection sample from RU-146, go to section 5.4.

5.1.11.4 To prepare a timed grab sample from RU-146, go to section 5.5.

5.2 RU-144 Continuous Collection Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.2.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.2.2 Change the sample chamber by first placing the DCU into "Privileged" Mode and then typing DCC 30 3 (1 or 2) and pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 15 (1 or 2) ENT.)

5.2.3 Proceed to section 5.6.

5.3 RU-144 Timed Grab Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are reestablished with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.3.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.3.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.3.3 Set the grab sample duration by first typing GSD 30 3 (sample duration in seconds) and then pressing <RETURN>. [Example: 90 seconds is entered as "9.00 01 ENT"] (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 16 (sample duration in seconds) ENT. Verify by typing DSP 3 16 ENT.)

5.3.4 Initiate the grab sample by first typing IGS 30 3 and then pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter FTN 3 02 ENT.)

5.3.5 Allow sample collection to complete before continuing. The RP Technician can use this time period to establish a Cold Area for the team.

5.3.6 Proceed to section 5.6.

5.4 RU-146 Continuous Collection Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.4.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. (At alternate locations. enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.)

5.4.2 Change the sample chamber by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 15 (1 or 2) ENT.

5.4.3 Proceed to section 5.6.

5.5 RU-146 Timed Grab Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.5.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.5.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.5.3 Set the grab sample duration by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 16 (sample duration in seconds) ENT. [Example: 90 seconds is entered as "9.00 01 ENT"]. Verify by typing DSP 3 16 ENT.

5.5.4 Initiate the grab sample by first placing the keyswitch in "ENABLE/LOCAL" and then entering FTN 3 02 ENT.

5.5.5 Allow sample collection to complete before continuing. (The RP Tech-nician can use this time period to establish a Cold Area for the team.)

5.5.6 Proceed to section 5.6.

5.6 High Range Collection

NOTE

RMS skid sampling may require passage through and/or working in general areas accompanied by high and varying dose rates. Constant attention must be given to background dose rates and expected high dose rates from the sample media. The travel route employed and sampling activities performed by Chemistry and RP should be acted and talked through prior to the actual sampling evolution.

5.6.1 With the necessary equipment, proceed to the monitor location.

5.6.2 Taking along that which is required, proceed to the monitor. If on location at RU-146, leave the lead pig with the lid open on the 140' elevation directly below the point from which the sample will be lowered. Carry the latch handle, handling tool, bucket, rope, and new filter head up the stairs to the monitor.

5.6.3 (The RP Technician shall) verify working dose rates at the monitor.

5.6.4 Ensure that the transfer pig lid is open and that the transfer pig is positioned for smooth and quick transfer of the sample. If on location at RU-146, tie one end of the rope to the bucket handle and the other end to the railing. Ensure that samples can be lowered without impairment.

5.6.5 Prior to isolating the sample flow valves, check the position of the solenoid valves to ensure that the channel has been isolated. The lamp above the active collection channel will be illuminated.

5.6.6 Close the inlet and outlet sample flow valves of the particulate / Iodine channel(s) as directed in the team briefing per the following chart:

P/I Chamber #1		P/I Chamber #2		P/I Chamber #3	
IN	OUT	IN	OUT	IN	OUT
HCV-02	HCV-05	HCV-03	HCV-06	HCV-04	HCV-07

5.6.7 Open the shielded door by raising the latch.

5.6.8 (The RP Technician should) measure the dose rate on the P/I holder. If the dose rate exceeds the contact reading [REM / hr] as specified in the team briefing, the shield door should be closed and the sample left to decay prior to removal.

5.6.9 Insert the latch handle tool over the sample assembly lever and turn it counter-clockwise to release the spring tension. (This step can be performed manually as dose rates permit.)

5.6.10 Remove the Iodine and particulate sample filter head from the assembly quickly and carefully using tongs or manually as dose rates permit.

5.6.11 (The RP Technician should) obtain 1-foot dose rate readings on the sample filter head.

5.6.12 Place the sample filter head in the lead transfer pig and replace the lid. If on location at RU-146, place the sample filter head in the bucket and lower it to the 140' elevation at the pig.

5.6.13 Place the new filter head in the monitor sample assembly.

5.6.14 Turn the lever on the sample assembly clockwise using the latch handle or manually as dose rates permit.

5.6.15 Close and latch the shielded door and open the appropriate inlet and outlet valves previously closed.

5.6.16 Obtain total flow values.

5.6.17 If necessary, use the RMS key to place the microprocessor in "Local" or "Enable" Mode.

5.6.18 At the microprocessor, enter DSP C 37 ENT to display total flow in cubic feet, where "C" refers to 3 for continuous grab sample chamber #1, 4 for continuous grab sample chamber #2, or 5 for the timed grab sample chamber.

5.6.19 Record this value on Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as appropriate.

5.6.20 Step the filter and zero the flow totalizer and timer by performing the following actions:

5.6.20.1 Enter STP C ENT to step the filter. Use the number previously entered as "C."

5.6.20.2 Verify that the totalizer has been re-zeroed by entering DSP C 37 ENT. Use the number previously entered as "C."

5.6.21 Return the microprocessor to "Remote" or "Disable" Mode.

5.6.22 Press the "TEST-LT CK" Button to ensure that microprocessor communications are restored.

5.6.23 (If on location at RU-146, return to the 140' elevation and place the sample filter head in the transfer pig and replace the lid.)

5.6.24 (The RP Technician will) contact the OSC Coordinator and (the Radiological Monitoring Technician will) contact the Chemistry Coordinator and relay that the filters have been changed.

5.6.25 Deliver the sample to the appropriate Counting Room.

5.6.26 (The RP Technician will) label and shield (or store), as designated, the sample to minimize background activity.

5.6.27 (The Radiological Monitoring Technician will) ensure that all necessary data is attached.

5.6.28 If the sample is to be transferred to an Unaffected Unit for counting, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

5.7 High Range Skid Sample Analysis

CAUTION

Contact dose rate readings on the particulate and Iodine assembly may be greater than 9.0 REM / hour. Maintain adequate distances, minimize time periods in proximity, and maximize the use of shielding to ensure that personnel doses during sample analyses are maintained ALARA.

5.7.1 Using the P/I radiation level at a distance of 1 foot from the P/I cartridge, (readings obtained previously or at this time with the pig lid removed), determine the best method to obtain an estimate of isotopic Iodine levels.

NOTE

Counting systems in the laboratory are restricted to approximately 0.25 Ci in the sample due to avalanche and Compton scatter of the sample.

5.7.2 If dose rates are > 0.8 REM / hour, perform the following actions:

5.7.2.1 Using section 9.0, Sample Data Reference, RMS P/I Dose Rate - Curie Conversion Factors, obtain the appropriate net dose rate Curie conversion factors for I131 through I135, according to the time elapsed from the time of the accident to the time of the sample.

5.7.2.2 Calculate the estimated Curie content using the following formula:

AI = R X G

where:

AI = Individual isotopic activity in Curies

R = Unshielded sample dose rate reading at 1 foot in REM / hour

G = Individual isotopic conversion factor for I131 through I135 from RMS P/I Dose Rate - Curie Conversion Factors in section 9.0, Sample Data Reference

5.7.2.3 Calculate the effluent Iodine concentrations using the following formula:

$$Ci = \frac{35.3 \times Ai}{V \times 0.04}$$

where:

Ci = Iodine concentration of isotope "I," µCi/cc

V = Sample volume, cubic feet

35.3 = Conversion factor, µCi - ft3 / Ci - cc

0.04 = Plate-out correction factor for RU-144 / RU-146 skid samples

5.7.2.4 Calculate the total Iodine concentration by summing the isotopic concentrations.

5.7.2.5 Proceed to section 6.0, Sample Analysis Follow-up.

5.7.3 If dose rates are less than or equal to 0.8 REM / hour, perform the following actions:

5.7.3.1 Using six 1-inch attenuator blocks initially, carefully and quickly place the sample filter head assembly in the lead shield in the sample holder rack at the highest elevation centered directly over the appropriate attenuator block. Remove blocks as necessary.

5.7.3.2 Perform sample analysis in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System. Multiply the sample volume by 0.04 Iodine plate-out correction factor.

5.7.3.3 Remove the sample from the lead shield quickly and carefully using tongs and place the sample in a lead cask / pig.

5.7.3.4 Proceed to section 6.0, Sample Analysis Follow-up.

6.0 Sample analysis follow-up

6.1 Control of Analyzed Samples

NOTE

Form EP-0514, Containment Radiochemistry CDA (Parts 1-11 - see Appendix C - Forms) can be used to facilitate transmittal of data to the Technical Support Center.

6.2 Report analytical results to the Chemistry Coordinator upon completion of sample analysis.

NOTE

As appropriate, it is recommended that the Boron sample be discarded to the Chemical Drain Tank to minimize handling of diluted and contaminated samples.

6.3 (The Chemistry Coordinator will) designate which samples are to be saved and which are to be discarded.

6.4 Analyzed samples designated to be saved shall be dose rated, labeled, and shielded (or stored) as specified by the RP Technician to minimize background activity.

7.0 Preplanned Alternate Sampling

CAUTION

- Significant exposure potential exists for the steps in this Section if performed under fuel failure conditions. The PASS should be used in all such conditions, if available. Team briefing and preparation must be planned with additional detail under fuel failure conditions in accordance with the guidance in this Section.
- The loss of the PASS unit will remove the built-in sample and recirculation path shielding provided by that system and the built-in control of airborne (gas) leakage.
- Section 9.0, Sample Data Reference, PASS Dose Information / Thumb Rules, applies to use of the PASS unit only. Use of the alternate sampling path under failed fuel conditions implies operating under worst-case conditions. It is imperative that actions are based on those conditions rather than assumptions because of the potential for lethal dose areas to exist.
- Dose rates in the primary sample sink area will mandate stay time controls for worst-case situations. It will be crucial to involve the RM Technician to provide full-time monitoring of RMS indications (dose rates and airborne levels) to assist the PASS team.
- Airborne problems are minimized using PASS, but have the potential to be extreme when using the Preplanned Alternate Sampling methodology. Breathing protection (SCBA or supplied air) should, therefore, be used if practicable.
- Analysis in the Affected Unit is highly doubtful when using the Preplanned Alternate Sampling methodology. Another Unaffected Unit laboratory should be prepared for sample analysis.

7.1 Review both Section 3.6 (specific information applicable to preplanned alternate sampling conditions and assumptions) and Appendices A and B of 74DP-9CY02, Post Accident Sampling Program.

7.2 Review Section 3 of 74OP-9SS05, Preplanned Alternate Sampling.

7.3 Clarify the planned sequence of actions with the sampling team and how these actions integrate with this procedure -- an example follows:

PASS is inoperable and an RCS liquid sample must be collected from the primary sample sink. The team would use part of Section 4 of 74OP-9SS05, Preplanned Alternate Sampling, to obtain a sample. They would then implement this procedure and perform Section 3.3, PASS Depressurized Liquid Sampling - Sample Analysis. (All actions should be acted and talked through during the briefing to ensure that a workable sequence of actions has been thoroughly formulated.)

7.4 Ensure all applicable actions relative to Appendix K - Emergency Exposures and KI have been addressed for the sample team.

7.5 Review the plant conditions with the sample team and the potential for fuel failure and its impacts.

7.6 Obtain the sample and analyze accordingly per the guidance disseminated in the team briefing.

8.0 Sample transportation

NOTE

Using the lead pig transfer rod, two individuals will be required to transport the lead pig containing the sample to an Unaffected Unit. The transfer rod should allow a 3-foot distance between each individual and the lead pig.

8.1 Onsite sample movement

8.1.1 (The RP Technician will) ensure that the sample is radiologically labeled and packaged, as appropriate, prior to transfer.

8.1.2 (The Chemistry Technician and Chemistry Coordinator will) determine the location to which the sample will be transferred.

8.1.3 (The Radiological Protection Coordinator and the RP Technician shall) determine the route based on current site conditions.

8.1.4 An Emergency REP and a team briefing shall be prepared, with all participating group personnel signed onto the REP prior to start of sample movement.

8.1.5 Advise the Security Director of the planned route of passage for Security escort and for the clearing of passageways in the receiving Unit, if appropriate.

8.1.6 Obtain an appropriate vehicle for transportation between Units as the activity and plant conditions warrant.

8.1.7 Prior to transfer, transmit copies of all applicable RP survey data and Chemistry information for the sample to the receiving Unit's RP and Chemistry Departments.

8.1.8 Prior to transfer, obtain acknowledgement of sample receipt preparations from the appropriate receiving Unit's department personnel.

8.1.9 Transfer the sample using planned resources, as necessary.

8.1.10 (Receiving Unit personnel will) assume continuation of performance in this procedure upon receipt of the transferred sample.

8.2 Offsite sample shipping

8.2.1 Labeling and shipping of samples will be performed by site personnel who are trained and qualified on applicable procedures in accordance with current site radwaste shipping and handling requirements.

9.0 Sample data reference

9.1 This information is based on PVNGS Calculation 03-NC-SS-A01, PASS Doses. The calculation is for a LOCA worst-case analysis and is based on the following. assumptions:

9.1.1 Sampling is performed in the Affected Unit using the PASS.

9.1.2 Analysis is performed in an Unaffected Unit.

9.1.3 Dose traveling to and from the Affected Unit is not included (~2 REM TEDE).

9.1.4 Use is made of remote handling tools.

9.1.5 Source term data is from Bechtel Calculation 13-NC-CH-304, Post LOCA Sample Doses.

9.1.6 Airborne dose rates from Bechtel Calculation 13-NC-ZA-322, Post LOCA Airborne Dose for PASS, are negligible.

9.1.7 Dose given is for normal ventilation operable and for loss of power conditions (i.e., loss of ventilation).

9.1.8 Extremity dose "EX" is SDE to the extremities.

Dose in REM	RCS Liquid	RCS Gas	CTMT Air	RCS Liquid w/ LOP	RCS Gas w/ LOP	CTMT Air w/ LOP
Preparation	0.36 DDE	0.37 DDE	0.37 DDE	1.32 DDE	1.75 DDE	1.53 DDE
Sampling	0.12 DDE	0.10 DDE	0.09 DDE	0.80 DDE	0.66 DDE	0.47 DDE
Dilutions	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX
Analysis	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX
TOTALS	0.53 DDE	0.47 DDE	0.46 DDE	2.20 DDE	2.40 DDE	2.00 DDE

Sample Type	Sample Quantity (cc or ml)	mrem / Hour @ 18"
RCS Liquid	0.1	425
	0.3	1270
	0.8	3400
RCS Gas	0.1	68
	0.5	340
Containment Atmosphere	0.1	2
	0.5	9

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

RCS LIQUID SUMMARY

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
0	450	1.5720	286.9
1	290	1.1723	248.9
4	150	0.8106	188.0
8	105	0.6441	163.4
12	84	0.5481	151.6
24	52	0.3912	132.8
48	30	0.2626	115.9
72	22	0.2051	107.4
168	12	0.1232	96.8
252	8.9	0.0923	95.9

RCS GAS SUMMARY			
0	430	1.4696	295.3
1	280	1.0949	256.2
4	140	0.7438	192.2
8	96	0.5799	166.0
12	74	0.4855	153.3
24	44	0.3329	132.3
48	24	0.2105	112.5
72	16	0.1577	102.0
168	7.8	0.0869	89.2
252	5.4	0.0611	88.4

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
	CONTAINMENT ATMOSPHERE SUMMARY		
0	4.30	0.0170	249.770
1	1.20	0.0074	163.230
4	0.45	0.0050	89.670
8	0.25	0.0041	59.654
12	0.18	0.0037	47.760
24	0.11	0.0031	36.496
48	0.08	0.0025	31.960
72	0.07	0.0022	30.775
168	0.04	0.0012	30.240
252	0.02	0.0008	30.603
	SI SUMMARY		
0	110	0.3657	290.970
1	69	0.2732	252.510
4	36	0.1874	190.200
8	24	0.1476	164.960
12	19	0.1247	152.720
24	12	0.0874	133.010
48	6.6	0.0571	114.920
72	4.6	0.0438	105.670
168	2.4	0.0254	94.245
252	1.7	0.0186	93.381

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

PASS LIQUID SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	70	0.1	14.29	4900	0.5	1.02	68600
0.1	900	70	0.1	12.66	4900	0.5	0.92	68600
0.1	800	70	0.1	11.43	4900	0.5	0.82	68600
0.1	700	70	0.1	10.00	4900	0.5	0.71	68600
0.1	600	70	0.1	8.57	4900	1.0	1.22	34300
0.1	500	70	0.1	7.14	4900	1.0	1.02	34300
0.1	400	70	0.1	5.51	4900	1.0	0.82	34300
0.1	300	70	0.1	4.29	4900	1.0	0.61	34300
0.1	200	70	0.1	2.86	4900	2.0	0.82	17150
0.1	100	70	0.1	1.43	4900	2.0	0.41	17150
0.1	90	70	0.1	1.29	4900			
0.1	80	70	0.1	1.14	4900			
0.1	70	70	0.1	1.00	4900			
0.1	60	70	0.1	0.86	4900			
0.1	50	70	0.1	0.71	4900			
0.1	40	70	0.2	1.14	2450			
0.1	30	70	0.2	0.86	2450			
0.1	20	70	0.3	0.86	1633			
0.1	10	70	0.5	0.71	980			
0.1	9	70	0.5	0.64	980			
0.1	8	70	0.5	0.57	980			
0.1	7	70	0.5	0.50	980			
0.1	6	70	0.5	0.43	980			
0.1	5	70	0.5	0.36	980			
0.1	4	70	0.5	0.28	980			
0.1	3	70	0.5	0.22	980			
0.1	2	70	0.5	0.14	980			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6. PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 7 ml and C2 = 1.4 mCi

PASS GAS SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	92	0.1	10.87	8464	0.5	0.59	155738
0.1	900	92	0.1	9.78	8464	0.5	0.53	155738
0.1	800	92	0.1	8.70	8464	0.5	0.47	155738
0.1	700	92	0.1	7.61	8464	0.5	0.41	155738
0.1	600	92	0.1	6.52	8464	1.0	0.71	77869
0.1	500	92	0.1	5.43	8464	1.0	0.59	77869
0.1	400	92	0.1	4.35	8464	1.0	0.47	77869
0.1	300	92	0.1	3.26	8464	1.0	0.35	77869
0.1	200	92	0.1	2.17	8464	2.0	0.47	38934
0.1	100	92	0.1	1.09	8464	2.0	0.24	38934
0.1	90	92	0.1	0.98	8464			
0.1	80	92	0.1	0.87	4232			
0.1	70	92	0.1	0.76	4232			
0.1	60	92	0.1	0.65	2821			
0.1	50	92	0.1	0.54	1693			
0.1	40	92	0.2	0.87	1693			
0.1	30	92	0.2	0.65	1693			
0.1	20	92	0.3	0.65	1693			
0.1	10	92	0.5	0.54	1693			
0.1	9	92	0.5	0.49	1693			
0.1	8	92	0.5	0.44	1693			
0.1	7	92	0.5	0.38	1693			
0.1	6	92	0.5	0.32	1693			
0.1	5	92	0.5	0.27	1693			
0.1	4	92	0.5	0.21	1691			
0.1	3	92	0.5	0.16	1693			
0.1	2	92	0.5	0.11	1693			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 9.2cc and C2 = 1.4 mCi

RMS P/I DOSE RATE - CURIE CONVERSION FACTORS					
Time After	I^{131} ("G")	I^{132} ("G")	I^{133} ("G")	I^{134} ("G")	I^{135} ("G")
Accident *(hours)*	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr
0	1.20E-02	1.30E-02	2.60E-02	2.80E-02	2.40E-02
1	1.20E-02	9.30E-03	2.40E-02	1.30E-02	2.20E-02
2	9.40E-03	5.40E-03	1.80E-02	4.40E-03	1.50E-02
3	2.40E-02	1.00E-02	4.50E-02	5.10E-03	3.50E-02
4	2.90E-02	9.00E-03	5.30E-02	2.80E-03	3.80E-02
5	3.40E-02	7.80E-03	6.00E-02	1.50E-03	4.00E-02
6	3.80E-02	6.40E-03	6.50E-02	6.80E-04	4.10E-02
7	4.20E-02	5.30E-03	7.10E-02	3.80E-04	4.10E-02
8	4.60E-02	4.50E-03	7.50E-02	2.10E-05	4.00E-02
9	5.00E-02	3.60E-03	7.90E-02	9.00E-05	8.10E-03
10	5.40E-02	2.90E-03	8.30E-02	4.90E-05	3.90E-02
11	5.90E-02	2.10E-03	8.70E-02	2.10E-05	3.80E-02
12	6.20E-02	1.70E-03	8.90E-02	1.10E-06	3.60E-02
13	6.60E-02	1.20E-03	9.20E-02	5.40E-06	3.50E-02
14	7.00E-02	1.30E-03	9.50E-02	2.60E-06	3.30E-02
15	7.40E-02	6.80E-04	9.70E-02	1.40E-06	3.20E-02
16	7.90E-02	7.20E-04	1.00E-01	5.80E-07	3.00E-02
17	8.20E-02	5.30E-04	1.00E-01	3.00E-07	2.90E-02
18	8.60E-02	4.00E-04	1.00E-01	1.60E-07	2.70E-02
19	9.00E-02	3.40E-04	1.00E-01	6.70E-08	2.60E-02
20	9.40E-02	2.60E-04	1.10E-01	2.60E-08	2.50E-02
21	9.80E-02	1.80E-04	1.10E-01	1.80E-08	2.30E-02
22	1.00E-01	1.90E-04	1.10E-01	6.70E-09	2.10E-02
23	1.10E-01	1.00E-04	1.10E-01	3.00E-09	2.00E-02
24	1.10E-01	9.30E-05	1.10E-01	1.00E-09	1.90E-03
24 - 48	1.60E-01	3.10E-06	1.10E-01	1.60E-13	7.80E-03
48 - 72	2.40E-01	4.40E-09	8.20E-02	1.60E-21	1.10E-03
72 - 96	3.00E-01	4.30E-12	5.00E-02	1.30E-29	1.20E-04
96 - 120	3.40E-01	3.70E-15	2.60E-02	9.10E-38	1.20E-05

NOTE: P/I exposure rate is calculated assuming that the measurement is taken 1 foot from the P/I cartridge. These conversion factors are independent of the distance that the radiation measurement is taken.

Appendix M - Ultimate Heat Sink considerations

1.0 Ultimate Heat Sink considerations

For an alternate source of Spray Pond inventory, direct Maintenance and Engineering to implement actions necessary to restore Spray Pond inventory, with particular respect to the following items:

1.1 Ensure that these actions are initiated within 6 days following a seismic event/SSE that results in irreparable damage to the 3 onsite wells which supply makeup water to the spray pond.

1.2 Secure a dependable water supply capable of delivering 1200 gpm within 21 days of an SSE or other accident which eliminates or restricts normal water supply to an inadequate level.

1.3 Ensure that the Environmental Department files a Notice of Intent to Drill with the Arizona Department of Water Resources before new well drilling commences.

1.4 Ensure that, as soon as practical, the Environmental Department applies for a temporary permit to withdraw groundwater in excess of our grandfathered right by submitting evidence that an emergency exists to the Director of the Arizona Department of Water Resources.

1.5 Ensure that Spare Well Water Pump (MLIS ID #45750074) and 200 HP, 3-phase, 1800 rpm Electric Motor (MLIS ID #44670001) have been adequately maintained under PM Task 054390.

1.6 Ensure an accurate assessment of current water inventory, normal water supply system status, time estimates for restoration of normal systems, identification of alternate supplies, and technically sound solutions to any outstanding water supply problems.

1.7 Ensure that a well drilling company capable of constructing a well within 15 days is mobilized.

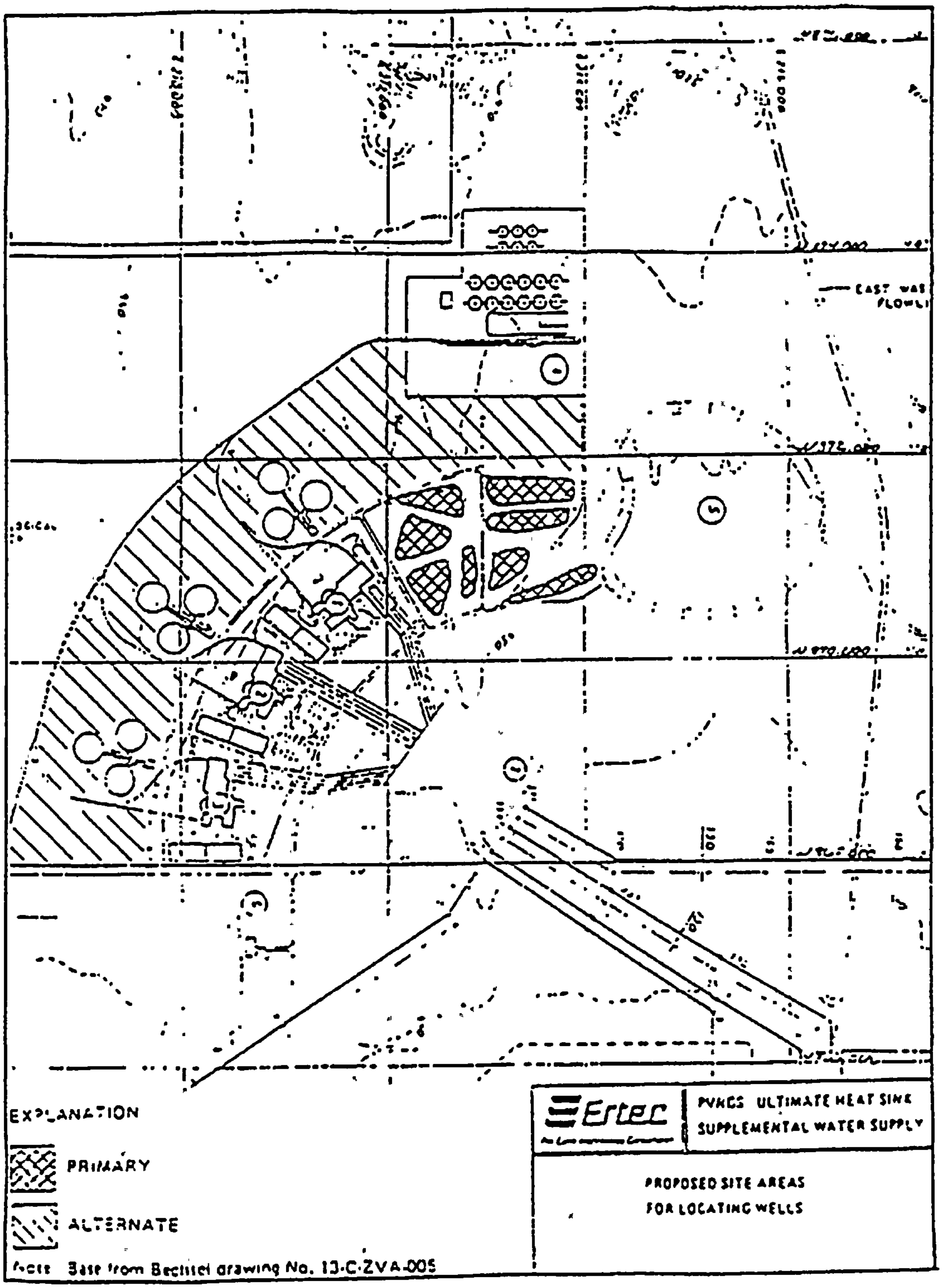
1.8 Ensure that a supply company capable of delivering temporary piping is mobilized.

1.9 Identify alternate routes to the site from Phoenix or possible equipment air lifts.

1.10 Determine the extent of damage to the 2 normal production wells 34abb and 27ddc and the standby well 27cbc with work initiated to restore the normal production wells and the standby well to service.

1.11 Reference the ERTEC drawing on the next page for well site selections.

2.0 Ertec Drawing



Appendix N - EOF Diesel Generator Operations

1.0 EOF diesel generator startup

1.1 On loss of power to the EOF, verify that both normal (1E-NAN-S06 source) and emergency (1E-NAN-S05) AC power is not available, by communicating with the Control Room of an unaffected Unit (there should be an LOP or Trouble on both the 1E-NAN-S05 and S06 buses). If power is verified to be out and it has been decided not to evacuate to the Backup EOF, then continue with this procedure. EOF maps included after the procedure steps may be of assistance.

NOTE

Immediately notify the Administrative & Logistics Coordinator if any problems are encountered in the conduct of this procedure. It may become necessary to evacuate the EOF.

1.2 Verify installation of the 4/0 (minimum) ground conductor between the generator breaker box and the ground lug provided beneath receptacle AE-NZN-I01.

1.3 Verify installation of the secondary trailer ground conductor between the trailer frame (tongue end) and the grounding conductor of transformer A-E-NGN-L51X.

1.4 Verify installation of the generator power cable plug to receptacle AE-NZN-I01. The keyway in the plug receptacle assembly ensures proper circuit phasing is maintained. Secure the plug to the receptacle using the integral receptacle fasteners.

CAUTION

The following step is critical to personnel safety and equipment protection. THIS STEP SHALL BE COMPLETED PRIOR TO THE APPLICATION OF GENERATOR POWER. This action isolates AEZYNDOX20 (PDP-E) panel loads from the building electrical distribution system, allowing alignment to the diesel generator.

1.5 With concurrent verification, at panel A-E-NZN-D0X-08 (EDP), open the circuit breaker marked "PDP-E MAIN BKR AEZYNDOX20" - "Main Panel PDPE" (this is the bottom breaker in this panel). All other breakers in this panel are to remain closed.

1.6 With concurrent verification, open all circuit breakers at distribution panel AEZYND0X20 (PDP-E).

1.7 With concurrent verification, unlock and close Safety Switch AE-NZN-U0X-02. [lock combination is 1796].

1.8 With concurrent verification, place the Safety Switch padlock upon door handle pin of panel A-E-NZN-D0X-08 (EDP) to secure and lock the door in the closed position.

1.9 Start the diesel generator as described below. The mechanical controls are located on the left side of the engine-generator trailer, on the engine itself.

NOTE

If the diesel will not start or run acceptably, notify the Administrative & Logistics Coordinator. It may be necessary to prepare to evacuate the EOF.

1.10 Locate the Engine Start switch. This switch is a push-to-turn, spring return to normal type, marked HEAT-OFF-START, that controls both the diesel glow plug pre-heating and the engine starter.

1.11 Push in, turn the switch to the left (CCW, to the HEAT position), and hold the switch in this position to preheat the diesel cylinders. Approximate preheat time requirements are described below:

Outside temperature	Pre-Heat Time
Above 60 degrees F	None
Below 60 degrees F to 32 degrees F	1 minute
Below 32 degrees F	2 minutes

1.12 Release the switch, then push-turn to the right (CW, to the START position) to start the engine. Release the switch when the engine commences to run.

1.13 Adjust the throttle (CW) adjacent to the starting switch as required to bring the engine to running speed, as indicated by the Voltage (490-500 VAC) and Frequency (61-63 Hz) Meters on the Generator Output Breaker Control Panel. This panel is located on the rear right side of the engine-generator trailer.

1.14 If radiological conditions permit, allow two minutes of unloaded run time before closing the generator output breaker and loading the generator.

1.15 With concurrent verification, close the generator AC output breaker (open the electrical box and push the breaker handle upward).

1.16 With concurrent verification, at Distribution Panel AEZYND0X20 (PDP-E), close the following breakers: Air Compressor CHC-1, Air Handler AO-1, Filter RFU-1, LPB Panel EOF, Mech. Equip. Rm Exhaust Fan EF-11, Pump No. 5 P-5, Chiller No. 2 C-2.

2.0 **EOF HVAC system restart**

NOTE

These steps assume that the EOF ventilation system is operating in the filtration mode and the cooling tower CT-1 is operating or available.

2.1 With concurrent verification, locate the Cooling Tower CT-1 Filter Isolation Valves V103 and V104. Verify they are in the open position (with handles parallel to the piping).

2.2 With concurrent verification, at Cooling Tower Control Panel AJZYNE05, verify the selector switch to (or set it to) position CT-1.

2.3 With concurrent verification, at Panel AEZYND0X20 (PDP-E) close the circuit breakers for pump P-2 and cooling tower CT-1.

2.4 With concurrent verification, at the control panel on Main Chiller #1, AMZYNE0X1, press the selector (rocker type) switch to STOP/RESET.

2.5 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

2.6 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

2.7 Check generator voltage and frequency at Control Panel; adjust throttle as required to maintain frequency above 60 Hz.

2.8 Return to EOF and report to Administrative and Logistics Coordinator that power has been restored.

2.9 OPTIONAL - Operational performance of the Air Handling Unit AEZYNA0X01 can be determined by observing the temperature differential between temperature indicators TI-0024 (chilled water return) and TI0025 (chilled water supply). After 5 minutes of chiller operation, the temperature of TI-0024 should be greater than TI-0025. The thermometer-type temperature indicators are mounted at eye level on the respective chilled water lines indicated above. See the "Building Arrangement" sketch 2 of 2 in this procedure for their approximate physical location in the room.

3.0 Brown-out

In the event that a diesel generator overload condition is detected (generator output current approaching 300 Amperes, or if "brown-out" conditions are detected in the EOF, perform the following steps:

3.1 Obtain the master key from the key box in EOF room #7.

3.2 Inside the EOF pump room (Room #14 - left wall) locate distribution panel LPB (AEZYNDOX14), and open the panel. Open breakers #31 through 42. This sheds the EOF duct heaters from the generator load.

3.3 If necessary, locate panel RBA (AEZYNDOX12) inside the telephone equipment room on the left side of the EOF Command Center (left wall). Open breakers #24, 26, 28, and 30. The master key will also open the room door if locked.

3.4 Re-check the generator load current at the engine panel to confirm the load demand is within acceptable limits.

3.5 Return the master key to the key box in Room #7.

4.0 Brown-out restoration

To restore the original conditions before the load-shed was accomplished:

4.1 Obtain the master key from key box in EOF Room #7.

4.2 Locate distribution panel LPB; re-close breakers #31 through 42.

4.3 Locate distribution panel RBA; re-close breakers #24, 26, 28, and 30.

4.4 Return the master key to the key box in room #7.

5.0 **Restoring normal power.**

NOTE

If available, Electrical Maintenance may be requested to perform the power restoration described below.

5.1 Notify the Administrative & Logistics Coordinator before diesel shutdown and power restoration. A short duration power outage of the EOF is required to perform realignment of the feeder circuit.

5.2 Verify that offsite power is available and has remained stable for 15 minutes minimum, and that normal and/or emergency AC power is available at the transfer switch A-E-NZN-U0X-01.

5.3 With concurrent verification, open all circuit breakers on the distribution panel AEZYND0X20 (PDP-E).

CAUTION

The following step is critical to personnel safety and equipment protection. This step shall be completed prior to the restoration of normal power.

5.4 With concurrent verification, remove the lock from the door handle of panel A-E-NZN-D0X-08;

5.5 With concurrent verification, open and LOCK safety switch AE-NZN-U0X-02. This isolates the diesel generator from the building power distribution system.

5.6 With concurrent verification, in the EDP panel [A-E-NZN-D0X-08], close the breaker feeding the PDP-E panel. This breaker is located at the bottom of the EDP panel

5.7 With concurrent verification, close all the breakers in distribution panel AEZYND0X20 (PDP-E), including those of the elevator and the water heater.

5.8 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

5.9 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

6.0 Shutting down the diesel engine:

6.1 Confirm that the EOF has been reconnected to the normal/emergency source(s) of off-site power.

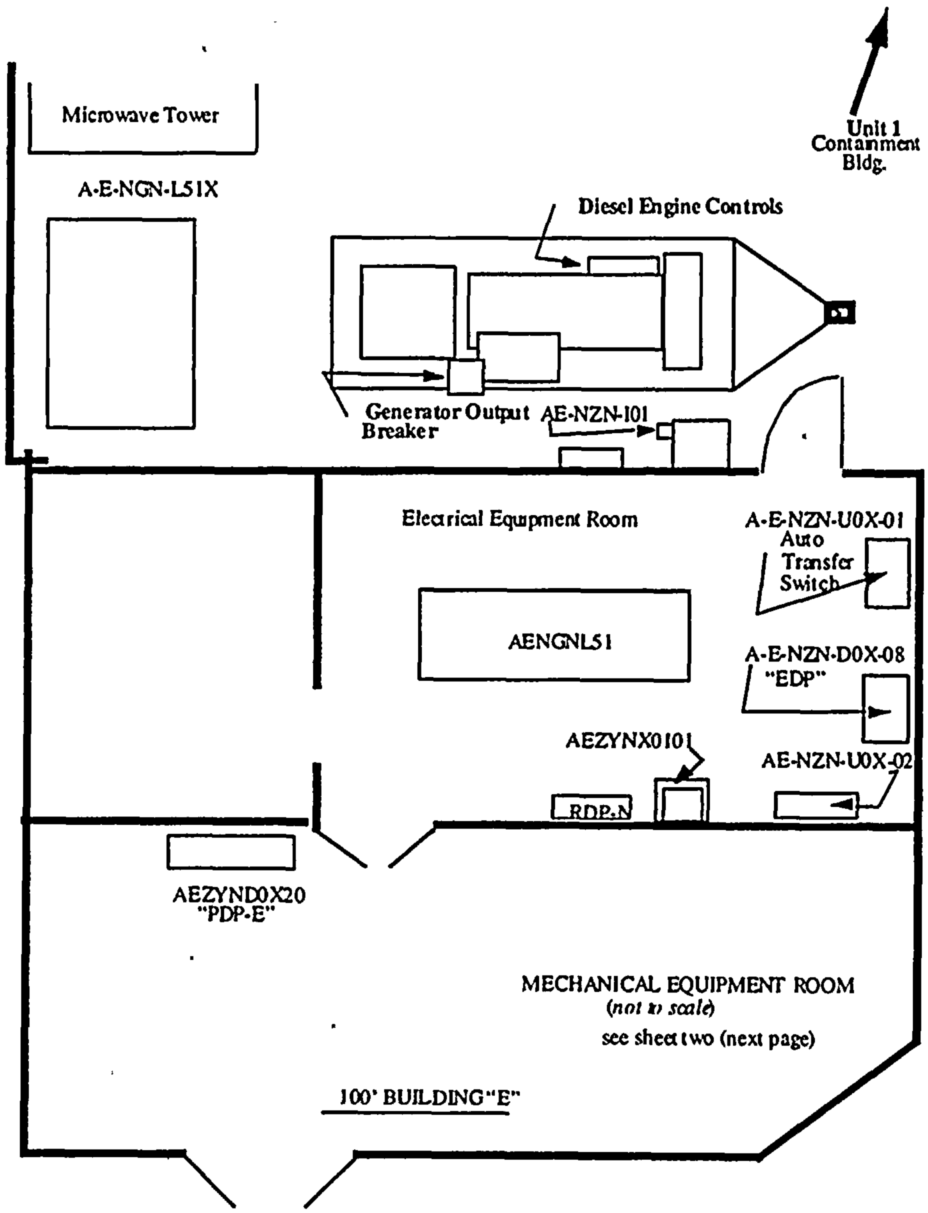
6.2 Return the throttle to the idle (approximately vertical) position.

6.3 Locate the STOP lever on the left side of the engine generator trailer (physical location is to the left of the starting switch). Rotate the lever approximately 30 degrees CW; this shuts off the fuel supply to the engine. Hold the lever in place until the engine is fully stopped, then release the stop lever.

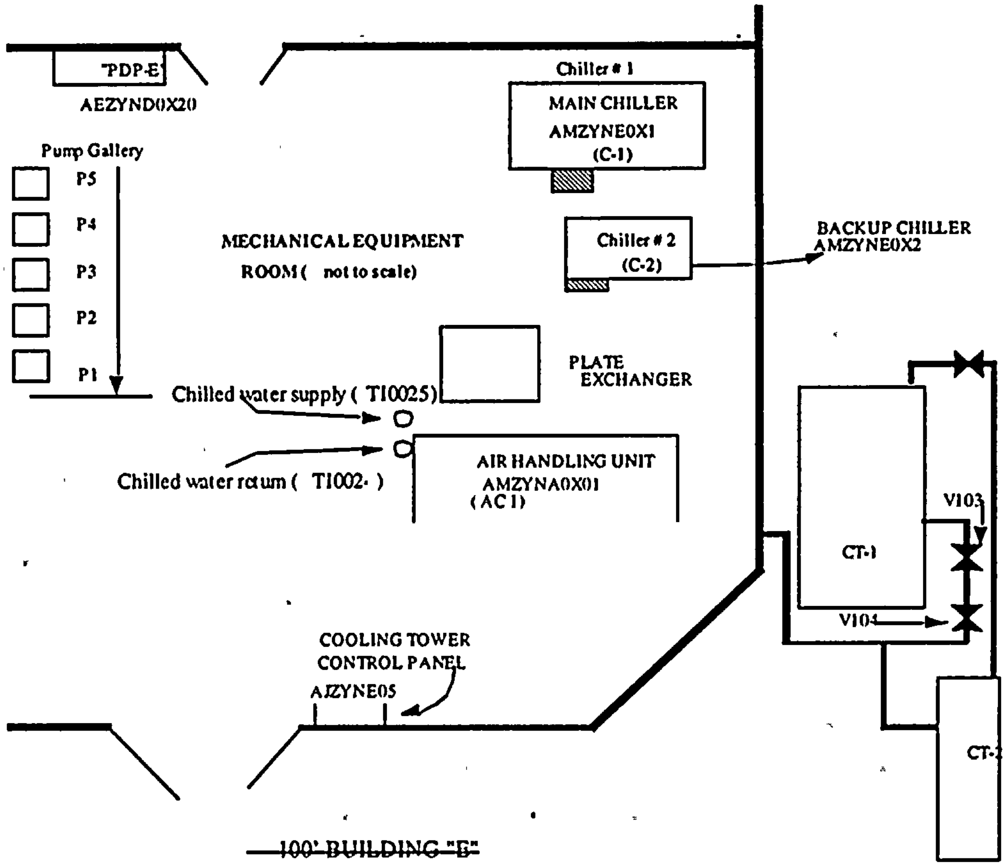
6.4 With concurrent verification, open the diesel generator AC output circuit breaker.

6.5 Notify the Administrative & Logistics Coordinator that power transfer has been completed.

Building Arrangement & Equipment Location (1 of 2)

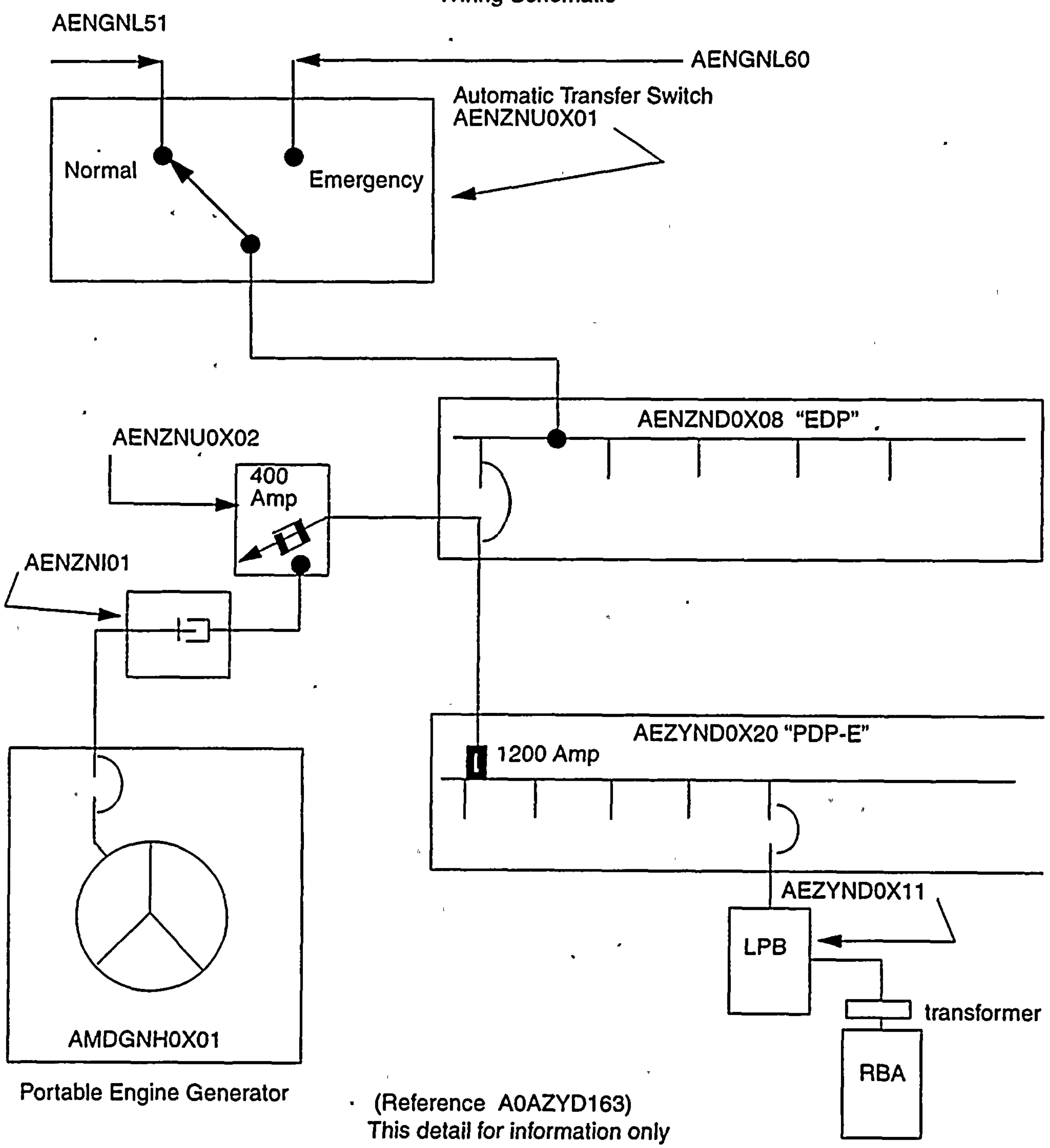


Building Arrangement & Equipment Location (2 of 2)



NOTE: ▨ Designates location of Chiller Control Panels

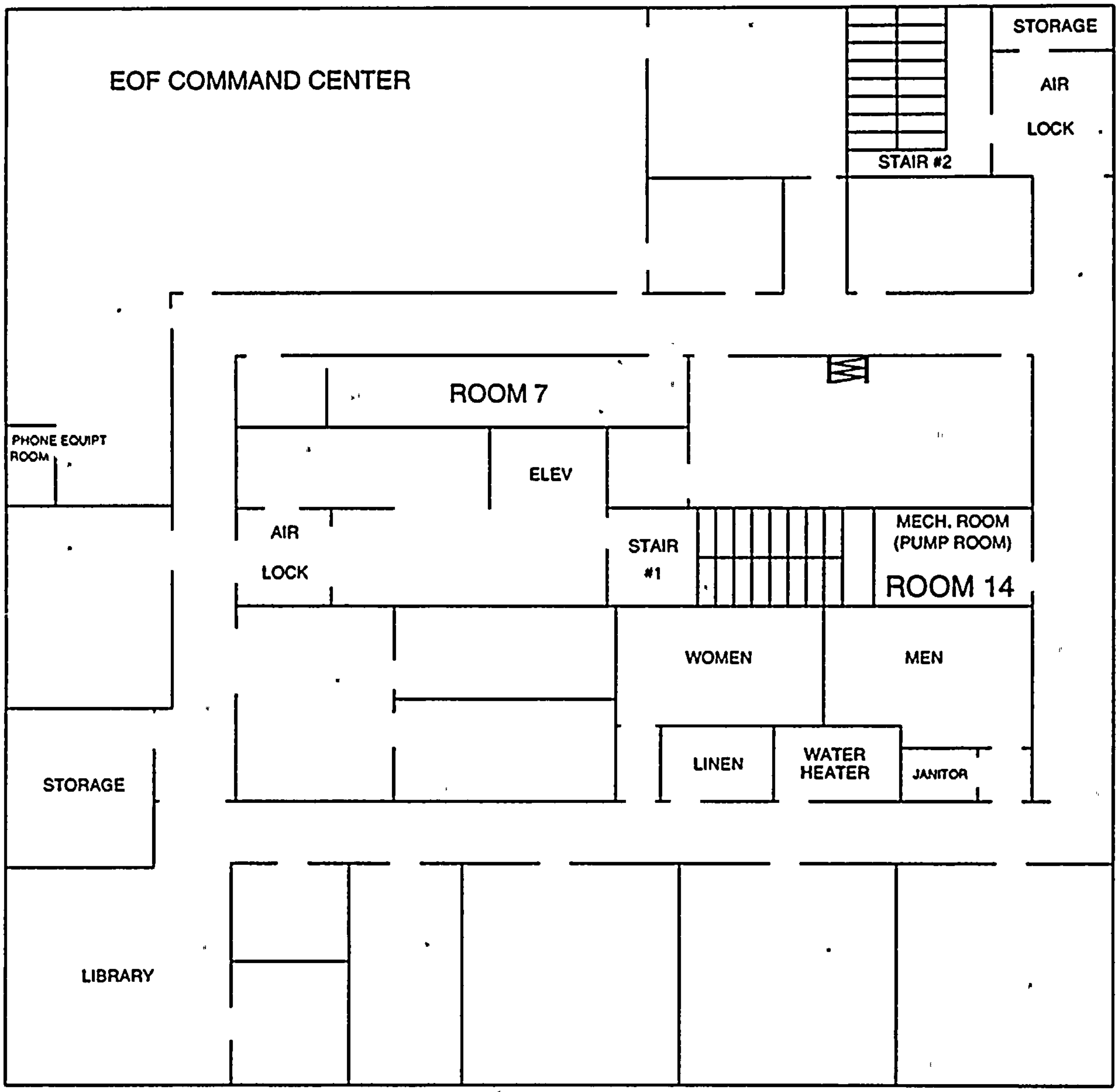
Wiring Schematic



Portable Engine Generator

(Reference A0AZYD163)
This detail for information only

EOF Floor Plan



Appendix O - ERFDADS operation

1.0 Noteworthy items:

1.1 ERFDADS is comprised of the following 4 sections:

1.1.1 SPDS Displays Menu

1.1.2 P&ID Menu

1.1.3 Thermal Performance (not addressed in this Appendix)

1.1.4 System Function Displays Menu

1.1.5 User Displays Menu (not addressed in this Appendix)

1.2 The mouse used for cursor positioning is optical in nature, making it sensitive to mouse pad orientation and mouse pad cleanliness. Food or drink should not be consumed near ERFDADS workstation areas.

1.3 If all data values on any display turn magenta, Operations Computer Systems (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

1.4 If the system appears to be functioning incorrectly or becomes locked up, the system should be rebooted.

1.5 Help is available from almost anywhere within the ERFDADS display regions. It can generally be accessed from the top menu bar by selecting the option with the left mouse button. A "Help" window will appear containing help for those items accessible within the main window in focus.

1.6 Top Menu Bar Functions

1.6.1 FILE

1.6.1.1 Reset Display: Redraws the current display back to defaults

1.6.1.2 Clear: Erases the current display except for the menu bars

1.6.1.3 Print Window Laser: Prints in black and white (this is the fastest printing option)

1.6.1.4 Enh Prnt Wndw Lsr: Prints an enhanced printout

1.6.1.5 Print Window Color: Prints a color printout

1.6.1.6 Quit: Ends the current mmi session and returns to the desktop

1.6.2 Edit: Allows use of cut and paste functions

1.6.3 OPTIONS

1.6.3.1 Point List: Lists all available ERFDADS points (~3000)

1.6.3.2 Trend List: lists all user-defined trends / groups

1.6.3.3 Logon: Allows access to controlled-access functions

1.6.3.4 Logoff: Allows logoff to prevent unauthorized access

1.7 Bottom Menu Bar Functions

1.7.1 Top Menu: Returns to the top main mmi display

1.7.2 Screen Up: Decrements 1 screen display

1.7.3 Screen Down: Increments 1 screen display

1.7.4 Previous Screen: Returns to the last displayed screen

1.7.5 Silence: Silences any Level 1 or Level 2 audible alarm

1.7.6 Audible List: Displays all points currently in alarm status

1.7.7 Text Input Box: Allows entry for a trend display name

1.8 MMI Menu Bar Functions: The mmi Menu Bar Functions are accessed by selecting the gray bar at the top of the current window with the right mouse button. The following options can be selected with the right mouse button from the drop-down menu:

1.8.1 Close: Reduces the mmi window to an icon

1.8.2 Full Size: Maximizes the current window to full-screen

1.8.3 Move: Allows for dynamic window positioning

1.8.4 Resize: Allows for dynamic window sizing

1.8.5 Back: Changes focus to other windows currently open

1.8.6 Refresh: Redraws the last display with the current time

1.8.7 Quit: Ends the current mmi session and returns to the desktop

1.9 Workspace Menu Functions: Workspace functions are accessible by closing the mmi window to an icon and selecting a point anywhere within the light blue background area with the right mouse button. The following options can be selected with the right mouse button from the pop-up menu:

1.9.1 Restart ERFDADS: Automatically shuts down and restarts the system

1.9.2 ERFDADS MMI: Allows opening of up to 4 mmi windows concurrently

1.9.3 ERFDADS CSF: Allows opening of a new SPDS window

1.9.4 Remote RMS: Opens RMS display for "Unit 1 (RED)", "Unit 2 (YELLOW)", or "Unit 3 GREEN)"

1.9.5 Print Tool: Allows spooling a SUN file to any of several printers

1.9.6 Print Window Laser: Allows black & white printout from a colored window

1.9.7 PTARS: Allows view / edit of post-trip trend data

1.9.8 Kill PTARS: Stops PTARS and returns to blank workspace display

1.9.9 Exit: Shuts down the system and returns to "Logon" display

1.10 SPDS Menu Functions: SPDS displays are configured to allow for monitoring of critical safety functions, to allow for event diagnosis and classification, and to notify Control Room personnel with messages similar to control board annunciators. 101 displays are available. Movement between multiple page displays can be performed by using the "Up / Down" buttons located toward the bottom of the display. The SPDS Display Menu consists of 2 pages listing the following options:

1.10.1 Critical Safety Functions: Contains 10 selections to allow operators to evaluate CSF criteria

1.10.1.1 Critical Safety Functions: Overall list of the individual critical safety functions

1.10.1.2 FR Safety Func Tracking: Allows tracking of the above functions

1.10.1.3 Safety Func Status Check: Shows status of the above functions

1.10.1.4 Reactivity Control: One of the critical safety functions

1.10.1.5 Vital Auxiliaries: One of the critical safety functions

1.10.1.6 Press Control: One of the critical safety functions

1.10.1.7 Heat Removal: One of the critical safety functions

1.10.1.8 CTMT Integrity: One of the critical safety functions

1.10.1.9 CTMT Atmos: One of the critical safety functions

1.10.1.10 Inventory Control: One of the critical safety functions

1.10.2 Safety Injection Delivery: Contains 4 selections to provide equipment status:

1.10.2.1 HPSI Curve: Displays HPSI pump curve based on current parameters

1.10.2.2 LPSI Curve: Displays LPSI pump curve based on current parameters

1.10.2.3 Train A/B SI: Displays current status of pumps / valves and parameters

1.10.3 Operator Information: contains 5 selections to aid operators:

1.10.3.1 Event Classification: Suggests event classifications based on parameters

1.10.3.2 Personalities: Allows selecting Control Room Supervisor, Primary Operator, or Secondary Operator

1.10.3.3 SPDS Overview: Provides an overview of SPDS

1.10.3.4 PZR Cooldown: Shows pressurizer cooldown rate in deg F/hr and 15 minute averages

1.10.3.5 RCS Cooldown: Plots 15-minute average primary cooldown rates

1.10.3.6 Multi-Input: Displays pages of multi-input parameters for SPDS

1.10.3.7 Rad Monitors: Summary of current radiation levels

1.10.3.8 RCS P/T - NPSH Curve: Displays RCP parameters with typical NPSH curves

1.10.3.9 ERDS Link: Allows activation of the ERDS link to the USNRC

1.11 Advisory Messages: At the bottom of each SPDS display are 5 buttons corresponding to 5 message sets the operator can use for immediate notification of system, component, or parameter status. Each can be displayed in 1 of 5 colors representing a hierarchy of importance. When a monitored parameter reaches a given message setpoint, the button holding the message set for that parameter will change to 1 of 5 colors and the message will be displayed within the bounds of the specified button. The 5 colors and their importance are represented as follows:

1.11.1 Red: Urgent informational messages

1.11.2 Yellow: Caution informational messages

1.11.3 Green: Important informational messages

1.11.4 Blue: Time-dependent informational messages

1.11.5 White: Helpful informational messages

1.12 Operator EOP Support: This area of the Safety Parameter Display System consists of a series of pages used to assist Control Room Operators in monitoring the status of the plant for each Emergency Operating Procedure. Following a reactor trip, ERFDADS will evaluate which event is occurring. When the "Overview" button is selected with the diagnosed EOP message, the system will display the diagnosed EOP display for that section. The diagnosis cannot be overridden. The diagnosed EOP support display must be escaped and the EOP support display for the desired EOP must be accessed. Each operator has access to selected pages in the EOP support area pertaining to the specific operator function relative to his/her Control Room position. These pages are consistent with plant equipment and parameters intended for that portion of the EOP a specific operator is currently performing. When a safety function is not satisfied, the Functional Recovery Procedure will be diagnosed by ERFDADS and the operators would begin monitoring the screens specific to that EOP.

1.13 P&ID Functions: P&ID displays organize system parameter data into a graphical layout of the system and provide the current data for each parameter associated with each layout. The 43 displays currently available are separated into similar categories - primary systems, secondary systems, electrical systems, etc. To access a system, select the P&ID box from the top menu. A display will appear with all the major systems categorically organized. Selecting a display will present that system along with most of the available ERFDADS points associated with that given system and the current status of each point. To view a trend of a specific parameter, select the given parameter's value. Either the attributes (analog or digital) display will appear or a multi-input display for a calculated point (SPDS point) will appear. If the multi-input display appears, select the point again for the attributes display. Selecting the "Trend-1" button located at the lower left portion of the attributes screen will display a trend for that specified point. To return to the system display, select "Previous Screen" twice (selecting the gray screen title button returns to the main P&ID display). Data is displayed in the P&ID screens using the following format:

1.13.1 Green: Reliable value

1.13.2 Magenta: Failed validity check

1.13.3 White: Suspect data

1.13.4 Orange: Exceeded a rate-of-change setpoint

1.13.5 Yellow: Exceeded a HI or LO setpoint (Level 2)

1.13.6 Red: Exceeded a HI-HI or LO-LO setpoint (Level 1)

1.13.7 Cyan: Manually input data

1.14 The following selections, attributes, displays, and options are available from the System Function Displays Menu:.

1.14.1 Alarm Mode Selection - This option changes the mode for which alarms are determined. Modes available are Modes 1-6 and Harsh Containment. The calculation is normally performed automatically, but can be overridden by Control Room Supervision via a logon password.

1.14.2 Analog Point Attributes - This option displays the current value for any analog ERFDADS point. Also provided is information on associated instrumentation and alarm values, if appropriate. Calculated points will list, in addition, the calculations and point values which are used to determine the SPDS point.

1.14.3 Archive Copy - For normal post-trip actions, the active PTARS file can be copied to the secondary PTARS file and the active 14-hour file, to the secon-dary 14-hour file. 15 minutes should be allowed for the copy procedure to complete. Data archived in this manner can only be accessed from the server it was saved to. Copying of files with this option is also allowed for DAT tape backup purposes. All archive operations from this option can be performed at any time, regardless of reactor status.

1.14.4 Archive Retrieval - This function is used to retrieve data for ERFDADS graphs and is different than PTARS retrieval. Output from 7 available files can be viewed as trend graphs, X-Y plots, tabular lists of values, or ASCII files.

1.14.5 Audible Alarm Configuration - (function available only to OCS personnel)

1.14.6 Demand Scan - Use this selection when data for a single point (analog or digital) is needed for any single point in time. Since the result is a "snapshot" of current conditions at the time it was invoked, the value will not change. This is in contrast to the analog / digital point attributes function, which maintains a continuing update of a specified value as it changes over time.

1.14.7 Digital Point Attributes - Functions identical to the Analog Point Attributes Function, except for digital points (i.e., valve / breaker / pump states) only. Alarms can also be assigned for this option following the same procedure as discussed previous. However, since digital points monitor 2 states (0 or 1), the only value gained would be alarming pump start / stop, valve open / close, or breaker open / close.

1.14.8 ERDS Communication Link - This option is used to activate the Emergency Response Data System link to USNRC Operations Center. Instruction for use is discussed in the Emergency Response Data System Instructional Guide.

1.14.9 External Health Interface - This option is used to monitor the status of communications links from ERFDADS to QSPDS, RMS, and ERDS for errors.

1.14.10 Group Update - This function allows the user to group sets of points for display as a group trend (up to 4 points per group), group bar chart (up to 6 points per group), or a tabular display (up to 24 points per page). Group trends default to the preset range and must be changed every time they are invoked if the range was not valid. This is in contrast to user trends, which are saved with the range selected by the user and will always be loaded into memory with that range.

1.14.11 Log Information Update - This option allows the user to retrieve a saved set of data that will display the current status and current parameter value when invoked. The data can also be spooled to a printer.

1.14.12 Log Summary - The summary contains a listing of user configured files which can be used for log information update. Selecting a file name from the menu will display the particular data input for that file.

1.14.13 Message Retrieval - Use this function to monitor error and system messages. Of the 6 messages, the Primary Alarm is the most useful choice, which will invoke a listing of all alarms that have occurred. Also displayed will be the time each has occurred and the time each has cleared (if relevant), the value that caused (and cleared) the alarm, and the type of alarm (Level 1 / Level 2). By specifying a filter, the user can select which alarms to display based on the plant system designator. The time frame available, however, is limited to the current active 14-hour file.

1.14.14 Password Update - Passwords can be changed from this option. Access is limited to Operations Computer Support personnel only.

1.14.15 Point Summaries - This summary provides a list used to check the status of various points, such as those alarming, those which have their alarm function bypassed, those which have an audible alarm assigned, those removed from scan, those assigned manually substituted values, or those currently without valid values. Separate listings exist for analog and digital points.

1.14.16 System Health - This function is used to monitor the status of all ERFDADS terminals having the ability to access the specific Unit's data (18 terminals).

1.14.17 Tabular Display - Selecting this option invokes a tabular listing of up to 24 points per page, each of which will list the point name, description, and the current value with units of measurement.

1.14.18 Unit / Server Switch - This option is used to change the Unit or server from which to receive data. 2 redundant servers exist, of which each is capable of performing all functions in the event that the other server is no longer capable of performing its function. Each STSC terminal in a specified Unit should be linked to a different server. When server changes are made and the "Apply" option is selected from the pop-up window, the white highlighted text will shift to the new server selected and the switching is completed. When switching Units, compliance with the pop-up message box is required. The user must wait approximately 1 minute for confirmation that the change has occurred prior to continuing.

2.0 Troubleshooting the System

2.1 Mouse Will Not Move or Moves Slowly - The mouse used for cursor positioning is optical in nature, making it sensitive to mousepad orientation and mousepad cleanliness. Rotate the mousepad 90º and clean the pad. Ensure that the mouse connector to the keyboard is fully inserted. Ensure that the keyboard connector to the computer is fully inserted.

2.2 System is Responding Extremely Slowly - The most likely cause is that both terminals are linked to the same server. Ensure that each terminal is linked to a different server. If the problem persists, exit the system on 1 terminal and log back on. Repeat this procedure for the other terminal.

2.3 Fatal Error Message Received When Trying to Retrieve Data - Verify that the correct date and time were entered and that the correct data file is being used for the date and time desired. For example, this error may occur if the user is attempting to retrieve data 18 hours old from the 14-hour file. This error can also occur when a user selects a PTARS data file and 1 of the points displayed is not a PTARS point. In this case, the invalid point should be deleted or a different data file type should be selected. Server shifts can also occur after performing an archive copy. The cause for this is unknown, but the user should ensure that the server the terminal is linked to remains the same after the copy is performed. If it is not, the terminal should be switched back to its original server.

2.4 MMI Display has Disappeared - Search for an mmi icon at the bottom of the current display. If found, reopen the window with a double-click on the icon with the left mouse button. If no icon is found, select a point anywhere within the light blue background area with the right mouse button. This action will invoke the Workspace Menu. Select "ERFDADS MMI" if listed or "Restart ERFDADS" if it is not.

2.5 Data is Missing From the Point List / Trend List - This error message can occur when trying to invoke a trend list or when trying to transmit a trend to 1 of the terminals in the Control Room. If an error message stating that no files can be found or that the file cannot be sent, the link to that module has most likely been lost. The system must be rebooted to reconnect all file links.

2.6 All Data Values on a Display Turn Magenta - 1 or both DAS Units have crashed. Invoke the "System Health" display from the "System Functions" Menu and view the status of the DAS Units. If only 1 unit is unavailable, switch to the available server. If both DAS Units are unavailable, the system is unavailable and is not accessible from any of the units. Contact 1 of the other Units to ensure availability of meteorological data. Operations Computer Support (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

2.7 Auto-Logout Message Received - This is a normal message that is received when 5 minutes have elapsed after performing a logon to activate ERDS or to perform an Archive Copy. The automatic logoff occurs to prevent unauthorized access should the user leave the area. Auto-Logout has no effect on system capabilities.

2.8 Color to Black & White Prints Not Working - If the correct screen print is not occurring (i.e., a zoomed icon picture prints), ensure that the mmi icon is reopened within 8 seconds. The "Snapshot" program incorporates an 8-second delay to allow the user to select the desired window. When the 8 seconds have timed out, the next item which is selected will print.

2.9 System Appears to Function Incorrectly or is Locked Up - Perform a system reboot.

3.0 System shutdown

If it becomes necessary to shut down the system for the purpose of rebooting, perform the following actions:

3.1 Close the "mmi" window by selecting the "down arrow" button toward the upper left portion of the display with the left mouse button.

3.2 Invoke the "Workspace Menu" by selecting a point anywhere within the light blue background area with the right mouse button.

3.3 Select "EXIT" from the "Workspace Menu" with the right mouse button.

4.0 System startup

If the system accepts no mouse commands, perform the following actions to start up the system:

4.1 Press the <STOP> and <A> keys simultaneously.

4.2 From the "Options" List, type N (new) at the ">" Prompt. (This display may not appear.)

4.3 Press <Return>.

4.4 When the "Type Help for more information" message appears, type sync on the "OK" Line.

4.5 Press <Return>.

4.6 At the Login Display, type ERFDADS (or the STA Login ID) and press <Return>.

4.7 At the "Password" display, press <Return>.

5.0 ERDS Transmission Data Set

POINT ID	DESCRIPTION	POINT ID	DESCRIPTION
ARF38	Condenser Air Removal Flow	SPDS 0093	RCS T-Cold Loop 1A
CPF42	Plant Vent Exhaust Flow	SPDS 0094	RCS T-Cold Loop 1B
HFF93	Fuel Building Exhaust Flow	SPDS 0095	RCS T-Cold Loop 2A
RDL10	Reactor Cavity Sump Level	SPDS 0096	RCS T-Cold Loop 2B
RDL410	CTMT Sump Level East	SPDS 0109	Time Since Reactor Trip
RDL411	CTMT Sump Level West	SPDS 0143	Wind Speed - 35' 15-Minute Avg
SEJ1AA	Excore Log Power Channel A	SPDS 0144	Wind Direction - 35'
SEJ1BB	Excore Log Power Channel B	SPDS 0146	Atmospheric Stability Class
SENIS1	Excore StartUp Power Channel 1	SPDS 0194	Estimated Core Flow - lb/m Avg
SENIS2	Excore StartUp Power Channel 2	SPDS 0203	Charging Flow
SIL706	CTMT Recirculation Sump A Level	SPDS 0215	LPSI A Flow
SIL707	CTMT Recirculation Sump B Level	SPDS 0216	LPSI B Flow
SPDS 0001	Pressurizer Pressure	SPDS 0217	HPSI Flow to Loop 1A
SPDS 0002	CTMT Pressure	SPDS 0218	HPSI Flow to Loop 1B
SPDS 0003	S/G #1 Pressure	SPDS 0219	HPSI Flow to Loop 2A
SPDS 0004	S/G #2 Pressure	SPDS 0220	HPSI Flow to Loop 2B
SPDS 0005	S/G #1 Actual Wide Range Level	SPDS 0606	RU-004 10-Minute Avg
SPDS 0006	S/G #2 Actual Wide Range Level	SPDS 0607	RU-005 10-Minute Avg
SPDS 0007	Auxiliary Feedwater Flow to S/G #1	SPDS 0635	RU-139A 10-Minute Avg
SPDS 0008	Auxiliary Feedwater Flow to S/G #2	SPDS 0636	RU-139B 10-Minute Avg
SPDS 0009	CTMT Temperature	SPDS 0637	RU-140A 10-Minute Avg
SPDS 0013	Log / Linear Reactor Power	SPDS 0638	RU-140B 10-Minute Avg
SPDS 0015	Reactor Vessel Level - Head	SPDS 0639	RU-141 10-Minute Avg
SPDS 0016	Reactor Vessel Level - Plenum	SPDS 0640	RU-143 10-Minute Avg
SPDS 0017	RCS T-Hot Loop 1	SPDS 0643	RU-145 / 146 10-Minute Avg
SPDS 0018	RCS T-Hot Loop 2	SPDS 0644	RU-148 10-Minute Avg
SPDS 0021	Subcooling Margin	SPDS 0645	RU-149 10-Minute Avg
SPDS 0052	RWT Level	SPDS 0671	RU-155D 10-Minute Avg
SPDS 0054	Actual Pressurizer Level	SPDS 5035	S/G #1 Feed Flow Rate
SPDS 0079	Representative CET	SPDS 5036	S/G #2 Feed Flow Rate
SPDS 0082	CTMT Hydrogen Concentration		

Appendix P - Recovery Organization

1.0 Noteworthy items

1.1 Recovery operations may initiate when the plant is in a controlled and stable condition. No action should be taken to disturb this condition without express approval of the Recovery Manager.

1.2 Long term post-emergency efforts that follow a major incident are a functional responsibility of the Recovery Organization and can be performed by PVNGS and other Arizona Public Service Company personnel, contract experts and specialists, and qualified engineers under the direction of the Recovery Organization.

1.3 The Emergency Operations Director, filled by the Vice President - Nuclear Production, or designated alternate, will assume the duties and responsibilities of the Recovery Manager and, with the advice of the Emergency Coordinator, will be responsible for implementing the direction in this document. S/he will have overall corporate responsibility for restoring the Unit to a normal operating configuration.

1.4 This document should be referenced when the Emergency Operations Director has determined that recovery operations are necessary to perform the following activities:

1.4.1 Identify the extent of station damage and radiological contamination

1.4.2 If appropriate, return the station to an operating status in compliance with Technical Specifications

2.0 Recovery actions

2.1 Notify affected offsite emergency management organizations (via NAN) and the USNRC (via FTS-2000 ENS) that recovery operations are in progress.

2.2 Request attendance in the Emergency Operations Facility to form the Recovery Organization by assigning available management personnel per the Recovery Organization Chart. Alternates can be utilized if positions cannot be filled by prescribed management individuals.

2.3 Direct Joint Emergency News Center personnel to conduct a final news briefing for the event and to facilitate the transfer of press operations to Arizona Public Service Media Relations.

2.4 Establish recovery operations by assessing the following issues during the implementation meeting:

2.4.1 Status of plant / site conditions, accessibility to contaminated areas, the need for additional decontamination, condition of plant equipment

2.4.2 Recovery of plant buildings or areas

2.4.3 Personnel exposures

2.4.4 USNRC involvement / interface

2.4.5 Level of offsite support required

2.4.6 Assignment of work groups, tasks, staffing, etc.

2.4.7 Logistics support - documentation, information flow, etc.

2.4.8 Preliminary damage estimates

2.5 For known or suspected significant plant damage, survey teams may be formed consisting of Operations, Engineering, Maintenance, and Radiation Protection personnel to ascertain the extent of physical damage and to identify areas of contamination and high radiation. Results of the surveys should be used by the Recovery Manager, the Station Operations Manager, and the Radiological Services Manager to plan the approach for repairing and returning the Unit to operation.

2.6 Under direction of the Recovery Manager, the Recovery Organization and selected offsite personnel, if applicable, should address the planning and coordination of the recovery effort. Activities such as the maintenance and repair of existing plant systems and/or components, modifications, installations, and decontamination should be discussed, prioritized, and planned. The need for portable shielding and special procedures should be addressed, as well.

2.7 Actual recovery operations may commence upon identification and prioritization of assessed issues, finalization of the recovery plan, development of special procedures, if necessary, and allocation of adequate repair equipment. The Recovery Manager will ensure that applicable personnel are properly trained prior to implementation of recovery operations. Training material should be developed and training conducted for specialized tasks identified.

2.8 In addition to specialized requirements in place, normal Unit / plant practices shall be followed regarding maintenance, repair, modification, installation, decontamination, and personnel exposure control.

2.9 The Radiological Services Manager should develop plans to process and control radwaste, estimate total population dose on a periodic basis in conjunction with state and federal authorities, and coordinate activities of staff Radiological Engineers and Radiation Protection personnel.

2.10 The Station Operations Manager should oversee in-plant operations on a daily basis. During recovery operations, s/he will be responsible for ensuring that plant repairs and modifications optimize post-recovery plant operational effectiveness and safety. Maintenance and Work Control Management will support the Station Operations Manager with required maintenance and repair work.

2.11 The Nuclear Support Manager should focus necessary engineering and contract resources on aspects of plant recovery requiring redesign or modification.

2.12 The Technical Support Manager should provide work analyses, guidelines, and procedures in direct support of plant operations.

2.13 The Quality Assurance Manager will ensure that the overall conduct of recovery operations is performed in accordance with corporate policy and regulations governing activities which may affect the health and safety of the public.

2.14 The Administrative / Logistics Manager will supply administrative, logistic, communications, and personnel support for the recovery operation.

2.15 The PVNGS Communications Manager should coordinate the flow of information to the media concerning recovery operations.

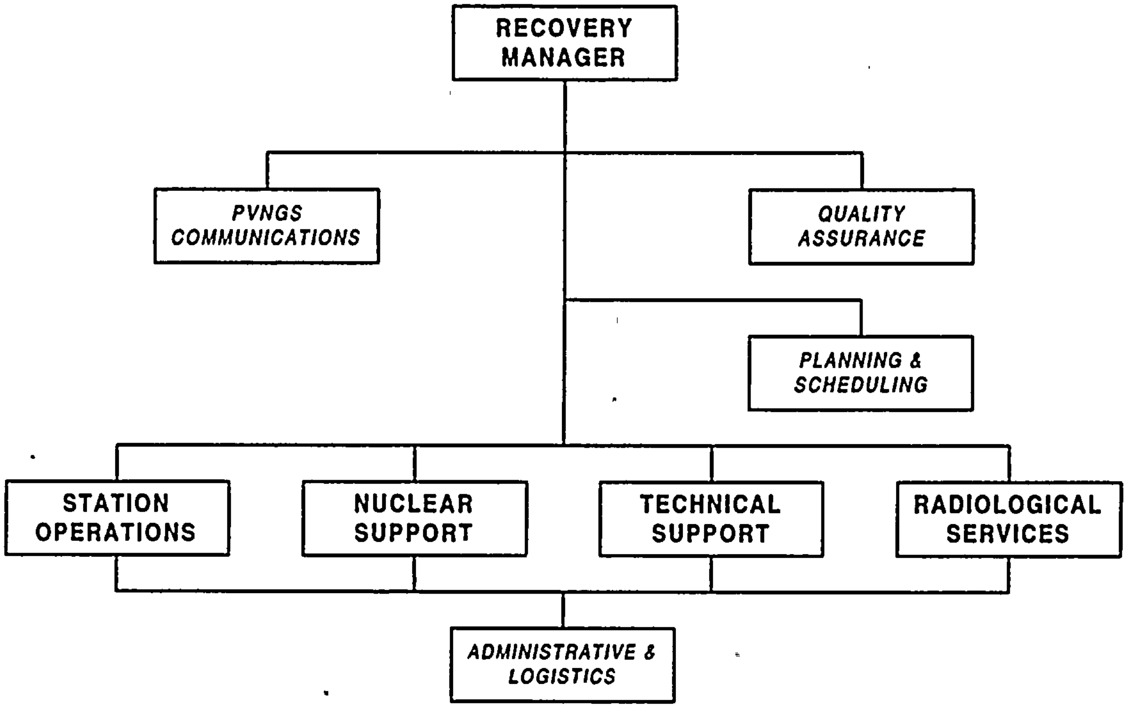
2.16 The Planning / Scheduling Manager will develop an overall schedule to guide the recovery effort.

2.17 During the course of recovery operations, unforeseen issues encountered shall be evaluated and factored into the overall recovery plan and the schedule adjusted accordingly.

2.18 Upon completion of recovery operations and prior to commencement of normal plant operations, Unit Technical Specification compliance shall be verified.

2.19 Upon completion of recovery operations, each Recovery Organization member shall submit all written documentation to the Recovery Manager, who will ensure it is forwarded to PVNGS Emergency Planning.

3.0 Recovery Organization Chart



RECOVERY ORGANIZATION	PVNGS RESPONSIBLE DEPARTMENT
RECOVERY MANAGER	EOD (Senior Vice President - Nuclear)
PVNGS COMMUNICATIONS	Strategic Communications
QUALITY ASSURANCE	Nuclear Assurance
PLANNING & SCHEDULING	Outage Department-Scheduling
STATION OPERATIONS	Operations
NUCLEAR SUPPORT	Nuclear Engineering / Projects
TECHNICAL SUPPORT	Operations Support
RADIOLOGICAL SERVICES	Radiation Protection
ADMINISTRATIVE & LOGISTICS	Nuclear Materials Management and Budgets
Italicized positions are not required as a prerequisite for formation and activation of the Recovery Organization	

Appendix Q - EAL Technical Bases

1.0 EAL TECHNICAL BASES

1.1 Introduction

1.1.1 Purpose of EAL Bases

1.1.1.1 This document was developed to provide a single source of information related to the Palo Verde Nuclear Generating Station emergency action levels. It describes the intention and technical basis for each emergency action level used to classify plant related emergencies.

1.1.1.2 Emergency action levels are plant specific indications, conditions, or instrument readings which are utilized to classify emergency conditions as defined in the PVNGS Emergency Plan. This Emergency Action Level Bases Document has been developed to facilitate the review process for revisions to the PVNGS Emergency Classification Procedure, provide historical documentation and justification for reference purposes, and to provide training to operators and decision makers that will enhance their comprehension of emergency classification.

1.1.2 Significance of EAL Bases

.1.1.2.1 Not only is it necessary to know when to declare an emergency, but it is also important to know the proper level of emergency to declare. Declaration of too low an emergency classification could result in a failure to mobilize the resources necessary to deal with a degrading plant condition. Declaration of too high an emergency classification could cause unwarranted public concern and hardship. There is no single criterion which can be used to determine the exact emergency classication for a given event or plant condition. NUMARC/NESP-007 lists a number of example initiating conditions for each of the emergency classifications. All of the emergency action levels in the PVNGS Emergency Classification Procedure are based on these initiating conditions.

1.1.2.2 Emergency action levels are, for the most part, symptom based. The action level is defined by values of key plant operating parameters which identify emergency or potential emergency conditions. This approach allows the full scope of variations in the types of events to be classified as emergencies. But, a purely symptom based approach is not sufficient to address all events for which emergency classification is appropriate. Therefore, events to which no predetermined symptoms can be ascribed are also utilized as emergency action levels since they may be indicative of potentially more serious conditions not yet fully realized. Moreover, other events are selected for inclusion as emergency action levels to ensure compliance with applicable regulatory guidance, particularly Regulatory Guide 1.101.

1.1.2.3 This document ties together the aspects of emergency response implementation to the plant specific characteristics of the Palo Verde Units. By providing a detailed description of the technical basis for each action level as well as a reference to the source requirement for the action level, this document should aid those people who need to make classification decisions.

1.1.3 Scope of bases

1.1.3.1 The EALs are addressed within section 1.0 in the order by which they appear in the PVNGS Emergency Classification Procedure, each on a separate page. The page format is also explained in section 1.0. The emergency classification which should result from the initiating condition represented by the EAL is given in the upper right corner. EALs dealing with barriers or releases are usually symptom based, while others may be event oriented. The technical basis for the EAL is provided in detail, followed by references to source documents as well as NUMARC/NESP-007. In cases where PVNGS procedures were used as a reference for the technical basis, Unit 1 procedures (indicated by a "1" as the second digit of the procedure number as in 41EP-1EO01) were used to develop the technical basis. It is not anticipated that there would be differences between unit specific procedures of a magnitude or nature sufficient to affect the development of the bases. Section 1.3 contains a matrix referencing EALs from NUMARC/NESP-007 to PVNGS Emergency Classifications.

1.1.4 Regulatory requirements and guidance

1.1.4.1 The current regulatory position on nuclear power plant emergency classification methods can be found in Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50). Specifically, 10 CFR 50.47(b)(4) states: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures."

1.1.4.2 10 CFR 50 Appendix E IV (c) states: "The entire spectrum of emergency conditions that involve the alerting or activating of progressively larger segments of the total emergency organization shall be described. The communication steps to be taken to alert or activate emergency personnel under each class of emergency shall be described. Emergency action levels (based not only on onsite and offsite radiation monitoring information, but also on readings from a number of sensors that indicate a potential emergency, such as the pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described. The existence, but not the details, of a message authentication scheme shall be noted for such agencies. The emergency classes defined shall include: (1) notification of unusual events, (2) alert, (3) site area emergency, and (4) general emergency. These classes are further discussed in NUREG-0654; FEMA-REP-1."

1.1.4.3 NUREG-0654/FEMA-REP-1, Rev. 1, Planning Standard II.D., states: "1. An emergency classification and emergency action level scheme as set forth in Appendix 1 must be established by the licensee. The specific instruments, parameters, or equipment status shall be shown for establishing each emergency class in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class.
2. The initiating conditions shall include the example conditions found in Appendix 1 and all postulated accidents in the Final Safety Analysis Report (FSAR) for the nuclear facility." Essentially, Appendix 1 of NUREG-0654 is one of the gauges to which emergency classification methods are measured. Revision 2 of Regulatory Guide 1.101, Emergency Planning and Preparedness of Nuclear Reactors, endorsed NUREG-0654.

1.1.4.4 Regulatory Guide 1.101, Revision 3 states: "The nuclear utility industry has now a decade of experience in adapting the NRC guidelines to develop sets of site-specific EALs and in using these EALs in exercises and under actual accident conditions. During this period, licensees have developed, offsite emergency response authorities have agreed upon, and the NRC has approved sets of EALs that represent broad variations in the ways the guidance in NUREG-0654 can be applied. It is possible that two plants, faced with identical conditions and applying their EAL schemes, would declare different levels of emergency (different ECLs). Also, there have been situations that were not contemplated when the guidelines were written and plant personnel were without specific guidance on which ECL to declare. ...In some cases, inconsistencies among initiating conditions together with broad ranges of risks with an initiating condition have resulted in some licensees declaring inappropriate ECLs.

In view of this experience, the Nuclear Management and Resource Council, Inc. (NUMARC) formed a task force to conduct a study to develop a systematic approach and support basis for development of emergency action levels. The methodology that was developed from this effort is described in NUMARC/NESP-007, Rev. 2, Methodology for Development of Emergency Action Levels, January 1992. NRC staff has reviewed the NUMARC methodology and considers it to be an acceptable alternative method to that described in NUREG-0654."

1.1.4.5 NUMARC/NESP-007, Revision 2 states: "This methodology develops a set of generic EAL guidelines, together with the basis for each, so that they can be used and adapted by each utility on a consistent basis. The review of the industry's experiences with EALs, in conjunction with regulatory considerations, was applied directly to the development of this generic set of EAL guidelines. The generic guidelines are intended to clearly define conditions that represent increasing risk to the public and can give consistent classifications when applied at different sites." PVNGS staff agrees with the NRC acceptance of the NUMARC methodology and adopts the guidance contained in NUMARC/NESP-007 as an alternative method to that described in NUREG-0654 for the development of emergency action levels (EALs).

1.1.5 Fission Product Barrier EAL Criteria

1.1.5.1 PVNGS Emergency Action Levels formulated according to the barrier based classification philosophy. As such, the ultimate emergency classification resulting from following PVNGS Emergency Action Levels will be based on combinations of EALS. These combinations are compiled using Table 4 of NUMARC/NESP-007 and are based on the following barrier criteria:

1. Notification of Unusual Event (NUE)

   Any loss OR any potential loss of Containment

2. Alert (ALERT)

   Any loss OR any potential loss of either Fuel Clad or RCS

3. Site Area Emergency (SAE)

   Loss of both Fuel Clad and RCS

   OR Potential loss of both Fuel Clad and RCS

   OR Potential loss of either Fuel Clad or RCS AND loss of any additional barrier

4. General Emergency (GE)

   Loss of any two barriers

   AND Potential loss of a third barrier

1.1.5.2 Although the logic used for the initiating conditions in PVNGS Emergency Action Levels appears overly complex, it is necessary to reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier. Notification of Unusual Event (NUE) initiating conditions associated with Fuel Clad and RCS Barriers are addressed under the LEAKAGE and MALFUNCTION Emergency Action Levels in PVNGS Emergency Action Levels.
- At the Site Area Emergency (SAE) level, there must be some ability to dynamically assess how far present conditions are from General Emergency. If Fuel Clad Barrier and RCS Barrier "Loss" EALs existed, this would indicate to the Emergency Operations Director (EOD) that, in addition to offsite dose assessments, continual assessments of radioactive inventory and containment integrity must be focused on. However, if both Fuel Clad Barrier and RCS Barrier "Potential Loss" EALs existed, the EOD would have more assurance that there was no immediate need to escalate to a General Emergency (GE).
- The ability to escalate to higher emergency classification levels as an event gets worse must be maintained. For example, RCS leakage steadily increasing would represent an increasing risk to public health and safety.

1.1.5.3 If a "Potential Loss" or "Loss" of a barrier in PVNGS Emergency Action Levels appears imminent (i.e., within 1 to 2 hours), a classification should be made as if the affected threshold(s) are already exceeded, particularly for the higher emergency classification levels.

1.2 Classification Criteria

1.2.1 Classification Criteria preface

1.2.1.1 NUREG-0654 FEMA REP-1 provides the definitions of each of the four emergency classifications as well as example initiating conditions which are indicative of each. The definitions provided in NUREG-0654 FEMA REP-1 are somewhat ambiguous in application and the example initiating events are not symptomatically definable or applicable in all cases.

1.2.1.2 There are three considerations related to emergency classification levels:

1. The potential impact on radiological safety, either as now known or as can be reasonably projected.

2. How far the plant is beyond its predefined design, safety, and operating envelopes.

3. Whether or not conditions that threaten health are expected to be confined to within the site boundary.

1.2.1.3 The following pages incorporate the four emergency classification level definitions as delineated within NUREG-0654. Additional discussion is provided on threshold determinations to eliminate ambiguities and to help clarify the intent of each of the emergency classification levels.

1.2.2 Notification of Unusual Event (NUE)

1.2.2.1 "Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occur."

1.2.2.2 Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant technical specification Limiting Condition for Operation (LCO) allowable action statement time for achieving required mode change. Precursors of more serious events should also be included because precursors do represent a potential degradation in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency classification level, however, releases do not require monitoring or offsite response (e.g., dose consequences of less than 10 millirem).

1.2.3 Alert

1.2.3.1 "Events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guideline exposure levels."

1.2.3.2 Rather than discussing the distinguishing features of "potential degradation" and "potential substantial degradation", a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency classification level is warranted, or whether de-escalation or termination of the emergency classification declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels (i.e., about 10 millirem to 100 millirem).

1.2.4 Site Area Emergency (SAE)

1.2.4.1 "Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels except near the site boundary."

1.2.4.2 The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines of NUMARC/NESP-007, clearly addresses NRC and offsite emergency response agency concerns as to timely declaration of a General Emergency.

1.2.5 General Emergency (GE)

1.2.5.1 "Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area."

1.2.5.2 The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore should be interpreted to include radionuclide release regardless of cause. In addition, it should address concerns as to uncertainties in systems or structures, e.g., containment, response, and also events such as waste gas tank releases and severe spent fuel pool events postulated to occur at high population density sites. To better assure timely notification, EALs in this category must primarily be expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with potential loss of the third barrier constitutes a General Emergency.

1.3 NUMARC/PVNGS EAL Matrix

1.3.1 EAL Matrix Preface

1.3.1.1 NUMARC/NESP-007 provides information by Recognition Categories in the following outline:

- A - Abnormal Rad Levels / Radiological Effluent
- F - Fission Product Barrier Degradation
- H - Hazards and Other Conditions Affecting Plant Safety
- S - System Malfunction

1.3.1.2 Within NUMARC/NESP-007, the initiating conditions for each of the Recognition Categories A, H, and S are in the order of Unusual Event, Alert, Site Area Emergency, and General Emergency. For Recognition Category F, the barrier-based EALs are presented in Table 4 (PWR).

1.3.1.3 PVNGS, as delineated in Emergency Action Levels and this EAL Technical Bases document, takes a like approach insofar as emergency classification order is concerned. However, PVNGS Emergency Action Level Event Categories have been outlined in a manner consistent with past practices due to human factors considerations. PVNGS Emergency Action Level Event Categories conform to NUMARC/NESP-007 criteria with the exception that PVNGS Emergency Action Levels further detail the EALs categorically. PVNGS Emergency Action Levels incorporate NUMARC/NESP-007 Recognition Category F as the Fission Product Barrier Reference. This layout is equivalent to the PWR-Table 4 of NUMARC/NESP-007 with the exception that the sub-columns and associated EALs for "Loss" and "Potential Loss" have been transposed due to human factors considerations. The three remaining NUMARC/NESP-007 Recognition Categories (i.e., A, H, S) are directly related to the seven PVNGS Event Categories under the following regime and comprise the rest of the PVNGS Emergency Action Levels :

- Electrical
- Radiological
- Leakage
- Malfunctions
- Hazards
- Security
- Miscellaneous

1.3.1.4 The matrix is entitled NUMARC/NESP-007 to PVNGS EAL Cross-Reference, where entries are categorized and sequenced according to NUMARC/NESP-007. This arrangement applies to Recognition Category sequence as well as emergency classification level hierarchy. A relation to the PVNGS Emergency Action Level Technical Bases can be found within the tables of PVNGS Emergency Action Levels, where the PVNGS EAL Identification Code associated with each EAL is embedded within each respective EAL Unit and corresponds to the PVNGS EAL Technical Bases number where the basis for the particular Emergency Action Level can be found. The matrix, together with PVNGS Emergency Action Levels, is intended to provide for an uncomplicated method to quickly relate EALs from one document to their counterparts in the other.

1.3.1.5 Specific NUMARC/NESP-007 Emergency Action Levels cross-referenced as "N/A" within the following tables signify no applicability of the generic EAL to PVNGS. These items are noted as exclusions to NUMARC/NESP-007 and are catalogued in section 1.4 of this document along with a basis for each exclusion.

1.3.2 EAL Matrix

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AU1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-3	N/A			
AU1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AU2-1	Table 3:	RADIOLOGICAL:		Row 6
AU2-2	Table 3:	RADIOLOGICAL:		Row 6
AU2-3	N/A			
AU2-4	Table 3:	RADIOLOGICAL:		Row 5

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
AA1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-3	N/A			
AA1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AA2-1	Table 3:	RADIOLOGICAL:		Row 6
AA2-2	Table 3:	RADIOLOGICAL:		Row 6
AA2-3	Table 3:	RADIOLOGICAL:		Row 6
AA2-4	Table 3:	RADIOLOGICAL:		Row 6
AA3-1	Table 3:	RADIOLOGICAL:		Row 6
AA3-2	Table 3:	RADIOLOGICAL:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AS1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AS1-2	N/A			
AS1-3	Table 3:	RADIOLOGICAL:		Row 4
AS1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AG1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AG1-2	N/A			
AG1-3	Table 3:	RADIOLOGICAL:		Row 4
AG1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - FUEL CLAD BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	Fuel Clad:		Row 2
3	Table 1:	Fuel Clad:		Row 1
4	Table 1:	Fuel Clad:		Row 2
5	Table 1:	Fuel Clad:		Row 3
6	N/A			
7	Table 1:	Fuel Clad:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - RCS BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	RCS:		Row 1
3	Table 1:	RCS:		Row 2
4	N/A			
5	Table 1:	RCS:		Row 3
6	Table 1:	RCS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - CONTAINMENT BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	CTMT:		Row 1, Row 2, Row 4
3	Table 1:	CTMT:		Row 3
4	Table 1:	CTMT:		Row 4
5	Table 1:	CTMT:		Row 3
6	Table 1:	CTMT:		Row 5
7	N/A			
8	Table 1:	CTMT:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HU1-1	Table 2:	HAZARDS		Row 7
HU1-2	Table 2:	HAZARDS		Row 8
HU1-3	Table 2:	MISCELLANEOUS:		Row 1
HU1-4	Table 2:	HAZARDS		Row 4
HU1-5	Table 2:	HAZARDS:		Row 2
HU1-6	Table 2:	HAZARDS:		Row 6
HU1-7	Table 2:	HAZARDS:		Row 9
HU2-1	Table 2:	HAZARDS:		Row 1
HU3-1	Table 2:	HAZARDS:		Row 5
HU3-2	Table 2:	HAZARDS:		Row 5
HU4-1	Table 2:	SECURITY:		Row 1
HU4-2	Table 2:	SECURITY:		Row 1
HU5-1	Table 2:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
HA1-1	Table 6:	HAZARDS:		Row 7
HA1-2	Table 6:	HAZARDS:		Row 8
HA1-3	Table 6:	HAZARDS:		Row 4
HA1-4	Table 8:	MISCELLANEOUS:		Row 1
HA1-5	Table 6:	HAZARDS:		Row 3
HA1-6	Table 6:	HAZARDS:		Row 6
HA1-7	Table 6:	HAZARDS:		Row 9
HA2-1	Table 6:	HAZARDS:		Row 1
HA3-1	Table 6:	HAZARDS:		Row 5
HA3-2	Table 6:	HAZARDS		Row 5
HA4-1	Table 7:	SECURITY:		Row 1
HA4-2	Table 7:	SECURITY:		Row 1
HA5-1	Table 6:	HAZARDS:		Row 2
HA6-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HS1-1	Table 7:	SECURITY:		Row 1
HS1-2	Table 7:	SECURITY:		Row 1
HS2-1	Table 6:	HAZARDS:		Row 2
HS3-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HG1-1	Table 7:	SECURITY:		Row 1
HG1-2	Table 7:	SECURITY:		Row 1
HG2-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SU1-1	Table 2:	ELECTRICAL:		Row 1
SU2-1	Table 5:	MALFUNCTIONS:		Row 4
SU3-1	Table 5:	MALFUNCTIONS:		Row 3
SU4-1	N/A			
SU4-2	Table 3:	RADIOLOGICAL:		Row 7
SU5-1	Table 4:	LEAKAGE:		Row 1, Row 2
SU6-1	Table 5:	MALFUNCTIONS:		Row 5, Row 6
SU7-1	Table 2:	ELECTRICAL:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
SA1-1	Table 2:	ELECTRICAL:		Row 2
SA2-1	Table 5:	MALFUNCTIONS:		Row 1
SA3-1	Table 5:	MALFUNCTIONS:		Row 2
SA4-1	Table 5:	MALFUNCTIONS:		Row 3
SA5-1	Table 2:	ELECTRICAL:		Row 1

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SS1-1	Table 2:	ELECTRICAL:		Row 1
SS2-1	Table 5:	MALFUNCTIONS:		Row 1
SS3-1	Table 2:	ELECTRICAL:		Row 3
SS4-1	Table 5:	MALFUNCTIONS:		Row 3
SS5-1	Table 5:	MALFUNCTIONS:		Row 2
SS6-1	Table 5:	MALFUNCTIONS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SG1-1	Table 2:	ELECTRICAL:		Row 1
SG2-1	Table 5:	MALFUNCTIONS:		Row 1

1.4 Exclusions to NUMARC/NESP-007

The EALs in the EXCLUSIONS TO NUMARC/NESP-007 Section are addressed ***in the order by which they appear in NUMARC/NESP-007*** and the basis and justification for exclusion of each NUMARC EAL will begin on a new page. The format of each page will comply with the following regime:

APP MODE: MODES x - x

CLASS: xxxxx

CATEGORY: [A, F, H, S] *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

EXCLUSIONARY BASIS:

(The full technical basis supporting the exclusion of the EAL from PVNGS Emergency Action Levels and any other information and/or justification regarding the basis)

SOURCE DOCUMENT:

(The source document(s) used as reference for the exclusionary basis)

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.

3. Valid reading on perimeter radiation monitoring system greater than 0.10 mR/hr above normal background for 60 minutes [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AU1-1, AU1-2, and AU1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2 .

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected Increase in Plant Radiation or Airborne Concentration.
3. (Site-specific) radiation reading for irradiated spent fuel in dry storage.

EXCLUSIONARY BASIS:

PVNGS does not incorporate spent fuel dry storage facilities in its design. Reliance on spent fuel temporary storage capabilities is accomplished in the Spent Fuel Pool and is addressed by AU2-1, AU2-2, and AU2-4. This EAL is excluded from the PVNGS EAL scheme because no spent fuel dry storage modules exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: **MODES 1 - 6** ***CLASS:*** **ALERT**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.

3. A valid reading on perimeter radiation monitoring system greater than 10.0 mR/hr sustained for 15 minutes or longer [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AA1-1, AA1-2, and AA1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6	CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 100 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AS1-1, AS1-3, and AS1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6 *CLASS:* GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 1000 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AG1-1, AG1-3, and AG1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	***CLASS:*** N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Fuel Clad Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Fuel Clad Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Other (Site-Specific) Indications (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Fuel Clad Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of RCS Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the RCS Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

4. Containment Radiation Monitoring (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

Two other radiation monitors, RU-148 and RU-149, which are the containment high range area monitors, would indicate off-scale LO readings under conditions warranting use of radiation monitoring when the reactor coolant noble gas and iodine inventory associated with normal operating concentrations *(i.e., within Tech Specs)* are assumed to be instantaneously released and dispersed into containment.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Containment Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Containment Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Containment Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e.. Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

7. Other (Site-Specific) Indications (Containment Barrier)

EXCLUSIONARY BASIS:

This EAL encompasses other site-specific indications which could be used to signify a "Loss" or "Potential Loss" of the Containment Barrier. Specifically addressed are area or ventilation monitors in the containment "annulus" or other contiguous buildings. PVNGS Emergency Operating Procedures do not provide for containment venting as a method utilized to preclude conditions where a potential loss or loss of the containment barrier could occur. Under these conditions, the hydrogen recombiners would be put into service some 100 hours subsequent to a loss of coolant accident *(LOCA)* for purposes of addressing the potential hydrogen problem which may result from the LOCA. Containment venting is only performed during normal routine plant operations.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Containment Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.

1. (Site-Specific) radiation monitor readings indicating fuel clad degradation greater than Technical Specification allowable limits.

EXCLUSIONARY BASIS:

This EAL is not applicable to PVNGS due to incorporation of no failed fuel monitor within its design. However, RCS Letdown Radiation Monitor, RU-155D, is used for trend analysis in determining changes in RCS activity which would denote changes in fuel clad integrity. It is neither Technical Specification related nor is it to be used for quantification of fuel clad degradation. The sole function of RU-155D is to provide trend data as a basis for RCS sampling frequency.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
Engineering Calculation 13-JC-SQ-215, RE-155D, Total Loop Uncertainty and Setpoint, Rev. 0
PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 2
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 00.10
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5 PVNGS EAL Technical Bases

1.5.1 Introduction

The EALs in the Technical Bases Section are addressed on the following pages, ***not necessarily in the order by which they appear in Tables 1 through 8 of the procedure,*** and the technical composition for each will begin on a new page. The format of each page will comply with the following regime:

APP MODE: MODES x - x | ***CLASS:*** xxxxx

CATEGORY: [A, F, H, S] *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

PVNGS EMERGENCY ACTION LEVEL (EAL):

(The PVNGS specific EAL as presented in PVNGS Procedures)

LOCATION: PVNGS Emergency Action Levels - Table (1 through 8): (Category, Row)

TECHNICAL BASIS:

(The technical basis supporting the EAL as stated)

NUMARC DEVIATION:

(The deviation(s) to the NUMARC/NESP-007 EAL and justification)

SOURCE DOCUMENT:

(The source document(s) used as reference for the basis and deviation justifications)

(EAL number)

n-n

1.5.2 1-1

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Core Exit Thermocouple Readings

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Highest valid CET temperature > 700°F*

LOSS: *Highest valid CET temperature > 1200°F*

LOCATION: Table 1: FUEL CLAD / Row 1

TECHNICAL BASIS:

Maximum allowed RCS pressure is 2750 psia per PVNGS Technical Specifications Section 2.1.2. Maximum instrument error *(specified in 41EP-1EO01 Appendix S)* for RCX-PT-102x, wide range pressurizer pressure instrument, is ± 390 psi. Maximum actual system pressure is 3140 psia for an indicated pressure of 2750 psia. Saturation temperature for this pressure is 702°F. If one or more CETs indicate 700°F or higher, subcooling has been lost for at least some locations in the core. CET indications at or above 700°F are a clear sign that core heat removal capability is lost or greatly reduced and one fission product barrier, the fuel clad, is threatened due to elevated fuel temperatures. 700°F qualifies as a condition representing a "Potential Loss" of the Fuel Clad Barrier.

The 1200°F temperature constitutes a "Loss" of the Fuel Clad Barrier per NUMARC/NESP-007, Rev. 2. It indicates significant superheating of the coolant.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10, Appendix S, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-1

1.5.3 1-2 (page 1 of 2)

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Reactor Vessel Water Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RVLMS level < 21% plenum*

LOSS: *N/A*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Steam voids may form in the reactor vessel [outlet] plenum as a result of inventory loss, pressure drop, or inadequate heat removal from the core when core temperatures exceed saturation for RCS pressure following a reactor trip. During this period, cooling is typically via natural circulation. If void size cannot be controlled and the void extends into the reactor vessel outlet plenum, the heat removal process shifts from subcooled natural circulation to less efficient and non-preferred reflux boiling. Any indication of void formation requires immediate attention to control and/or reduce the size of the void and to maintain RCS heat removal capability. Voiding in the outlet plenum is most likely caused by loss of inventory or by loss of pressure control in the RCS. In either case, the fuel clad is threatened with perforation due to elevated centerline temperatures from the lower heat removal capability of reflux boiling compared to natural circulation.

The Reactor Vessel Level Monitoring System *(RVLMS)* is comprised of eight Heated Junction Thermocouples *(HJTC)* oriented vertically above the upper Fuel Alignment Plate *(FAP)* in the reactor vessel. As head and outlet plenum *(hot leg)* levels decrease, HJTCs begin to become uncovered, causing indicated temperatures for the affected HJTCs to rise as temperatures approach saturated conditions during development of the steam void. Indicated levels read out as incremental values on 1E Class instrumentation in the Control Room.

1-2

1.5.4 1-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Corresponding detector numbers and their respective indicated readings are as follows:

Detector Number Meter Reading

1 *(uncovered)* 67% head
2 *(uncovered)* 41% head
3 *(uncovered)* 16% head
4 *(uncovered)* 0% head
5 *(uncovered)* 73% plenum
6 *(uncovered)* 47% plenum
7 *(uncovered)* 21% plenum
8 *(uncovered)* 0% plenum

As can be seen, once Detector 8 becomes uncovered and detects saturated conditions, indicated level will proceed from 21% plenum to 0% plenum. From this point on, as vessel level continues to lower, it can no longer be discerned as to where actual reactor vessel water level is. The value chosen in this EAL conforms to the generic basis in that "< 21% plenum" indicates a potential loss of the Fuel Clad Barrier, as actual water level may be at the top of the active fuel, or below.

NUMARC DEVIATION:

While actual reactor vessel water level may be above the active region of the fuel after indicated water level reaches "0", it can no longer be determined exactly where actual level is when level continues to decrease. Conservatively, an assumption must be made at the time that vessel water level is AT the top of the active fuel.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ54, Monitoring the Reactor Vessel Inventory with RVLMS Inoperable, Rev. 01.02
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.5 1-3

APP MODE: MODES 1 - 4 **CLASS:** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Primary Coolant Activity Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *RCS activity > 300 µCi/gm Dose Equivalent I-131*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Due to the likelihood of fuel damage during an ATWS caused by fuel overheat due to either mechanical binding of stuck CEAs or Reactor Trip Switchgear Breaker failure, this EAL would be met if a chemistry sample analysis indicated that fuel damage exists, as signified by Dose Equivalent Iodine^{131} exceeding 300 µCi/gm. This amount of coolant activity is well above that expected for Iodine spikes and corresponds to about 2% to 5% fuel clad damage, which indicates significant clad heating. Thus, the Fuel Clad Barrier is considered lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-3

1.5.6 1-4

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Containment Radiation Monitoring

PVNGS EMERGENCY ACTION LEVEL (EAL):
POTENTIAL LOSS: *N/A*

LOSS: *CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr or RU-149 > 1.8E+06 mrem/hr*

LOCATION: Table 1: FUEL CLAD / Row 3

TECHNICAL BASIS:
The containment HI range area monitors, RU-148 and RU-149, provide radiation accident condition information inside containment. Bechtel Calculation 13-NC-ZY-216 provides a basis to correlate the readings from RU-148/RU-149 to a Core Damage Fraction *(CDF)*. The calculation uses CESSAR Table 15.6.5-1 for Source Term and assumes that 100% of the Equilibrium Noble Gas and 25% of the Equilibrium Iodine are airborne in containment. Per this calculation, a CDF of 1% equates to readings of 1.2E+06 mrem/hr on RU-148 and 1.8E+06 mrem/hr on RU-149 and is based on 300 μCi/gm Dose Equivalent Iodine^{131} in the containment atmosphere. An assumption in the calculation consists of a reactor shutdown 15 minutes ago, yielding an effective age of 0.25 hours. The corresponding readings for both radiation monitors differ slightly due to their respective physical locations within containment.

NUMARC DEVIATION:
NUMARC/NESP-007 specifies these values should be based on an "approximate" clad failure of 2%-5%, depending on core inventory and RCS volume. Cores associated with the PVNGS Units are larger than normal and the Bechtel Calculation assumes 1% clad failure with a LOCA to arrive at the values given for this EAL.

SOURCE DOCUMENT:
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Procedure 74CH-9ZZ87, Iodine-131 Dose Equivalent Determination, Rev. 2
PVNGS Unit 1 Technical Specifications, Amendment 74
Bechtel Calculation 13-NC-ZY-216, Rev. 1
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Table 15.6.5-1
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-4

1.5.7 1-5

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

7. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier*

LOCATION: Table 1: FUEL CLAD / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Fuel Clad Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007. Methodology for Development of Emergency Action Levels, Rev. 2

1-5

1.5.8 1-6 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. RCS Leak Rate

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RCS leak > 44 gpm*
LOSS: *RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling (i.e., RCS at saturation conditions)*

LOCATION: Table 1: RCS / Row 1

TECHNICAL BASIS:

RCS leakage is the flow of any reactor coolant out through the RCS pressure boundary to any location by a means other than design flow or drainage of coolant as part of an authorized procedure. It may be detected by any or all of the following means:

- Increasing containment radiation levels or airborne activity levels.
- Increasing containment sump levels, temperature, pressure, or humidity.
- Increasing steam generator blowdown radiation levels or steam line radiation levels or steam generator activity.
- Increasing radiation levels, airborne activity levels, or sump levels in the auxiliary building.
- Decreasing RCS pressure or pressurizer level *(with no other transient in progress).*
- Reactor Coolant System leak rate determination.

Measurement of the rate may be made by an RCS inventory balance *(conducted at least every 72 hours in accordance with 40ST-9RC02, RCS Water Inventory Balance, or as part of Procedure 41EP-1RO02, Loss of Coolant Accident)* or by observation that pressurizer level continues to decrease with letdown isolated and one charging pump running in a normal configuration.

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any RCS leakage which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of RCS subcooling has occurred. The loss of RCS subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

1-6

1.5.9 1-6 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.10 1-7 (page 1 of 2)

APP MODE: MODES 1 - 4 *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. SG Tube Rupture

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *SGTR leak > 44 gpm*

LOSS: *SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1)*

LOCATION: Table 1: RCS / Row 2

TECHNICAL BASIS:

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any SGTR event which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses ruptured S/Gs with an unisolable secondary line break corresponding to the loss of the RCS Barrier and the Containment Barrier. *(NOTE: the Containment Barrier loss is represented by the "Secondary Side Release with Primary-to-Secondary Leakage" EAL.)* This allows the direct release of radioactive fission and activation products to the environment. Since actual leak rate is a function of the offsite dose rates attainable for this event, 132 gpm is consistent with the diagnostic activities of the applicable Emergency Operating Procedure *(i.e., 41EP-1RO03, Steam Generator Tube Rupture)*. This includes indication of a primary coolant inventory reduction and increased secondary radiation levels. 41EP-1RO08, Functional Recovery, would be the applicable procedure for a SGTR along with an uncontrolled or complete depressurization of the ruptured S/G. Secondary radiation increases are observed via radiation monitoring of condenser off-gas, S/G blowdown, main steam, and/or S/G sampling. Determination of the "uncontrolled" depressurization of the ruptured S/G is based on indication that the pressure decrease in the ruptured S/G is not a function of normal operator actions. The Limitations Topic Area in PVNGS Emergency Action Levels, qualifies this part of the event. Emergency Operating Procedures direct the subsequent plant cooldown to take place utilizing steaming of the unaffected S/G. The "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization due to the same effect this action has on offsite dose rates in relation to dose rates caused by steam line breaks or stuck open S/G safety valve*(s)*.

1-7

1.5.11 1-7 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance with the exception of where the "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization, as referenced in the PVNGS Emergency Action Levels. This condition would involve a prolonged release of contaminated secondary coolant from the affected S/G to the environment if that affected S/G is utilized for plant cooldown to Mode 5 *(Cold Shutdown)* because plant Emergency Operating Procedures direct plant cooldown via steaming of the unaffected S/G to the condenser, which is the preferred path.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO03, Steam Generator Tube Rupture. Rev. 00.08
PVNGS Procedure 41EP-1RO08. Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels. Rev. 2

1.5.12 1-8

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Other (Site-Specific) Indications

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *LOAF such that minimum acceptable feedwater flow cannot be maintained*

LOSS: *N/A*

LOCATION: Table 1: RCS / Row 3

TECHNICAL BASIS:

This EAL addresses the inability to initially remove heat from the RCS during early stages of an event, thereby jeopardizing the Heat Removal Safety Function. If emergency auxiliary feedwater flow *(and main feedwater flow)* required by design is insufficient to remove the amount of heat from at least one steam generator, an extreme challenge should be considered to exist and the RCS Barrier is potentially lost. Procedure 41EP-1RO05, Loss of All Feedwater, includes provisions for establishing feedwater flow to the S/G*(s)* under conditions where no flow could be established from the Control Room. A potential loss of the RCS Barrier exists if actions from outside the Control Room are required to establish or maintain minimum acceptable feedwater flow and all attempts from the Control Room to establish or maintain acceptable feedwater flow have been exhausted.

NUMARC DEVIATION:

This "Potential Loss" EAL meets the NUMARC/NESP-007 intent of other indications. The EAL includes a Control Room diagnosis that a loss of all feedwater condition exists with indications that feedwater flow to at least one S/G cannot be initiated or maintained from the Control Room.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO05, Loss of All Feedwater, Rev. 00.07
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-8

1.5.13 1-9

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier*

LOCATION: Table 1: RCS / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the RCS Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-9

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APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Containment Pressure

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Row 1: CTMT pressure 50 psig and increasing*
Row 2: CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating
Row 5: H_2 concentration > 3.5% by volume

LOSS: *Row 1: Rapid unexplained CTMT pressure decrease following initial increase*
Row 2: CTMT pressure or sump level response not consistent with LOCA conditions

LOCATION: Table 1: CONTAINMENT / Row 1, Row 2, Row 4

TECHNICAL BASIS:

The only likely cause for a pressure excursion in containment at or exceeding 50 psig is a LOCA with failure of containment pressure control systems. CIAS setpoint is 3 psig. Containment Spray setpoint *(CSAS)* is 8.5 psig. In order for containment pressure to reach 50 psig, both Containment Spray trains must have already failed. Maximum allowed containment pressure by Technical Specifications is 2.5 psig. Design pressure is 60 psig. The proximity of containment pressure to design pressure, in combination with probable elevated containment air temperatures in the case of a LOCA and the demonstrated inability to control containment pressure, make the failure of containment likely. This "Potential Loss" EAL is included in PVNGS Emergency Action Levels to provide clear indication that containment integrity is threatened and to provide for a path of further escalation in the case of one or two fission product barriers already lost or threatened.

The likely source of hydrogen in containment is a LOCA into containment accompanied by severe fuel melt. A metal-water reaction of the zircalloy clad produces hydrogen in the core, which is then released into containment. Other possible sources include: radiolytic decomposition of post-LOCA emergency cooling solutions or corrosion of metals and paints by emergency cooling containment spray solutions. The conservative approach assumes that severe core damage is the source. Core damage and leakage of this magnitude clearly indicate a failure of two fission product barriers. Hydrogen levels of this magnitude in containment would likely be accompanied by elevated containment pressure and, with hydrogen approaching the lower flammable limit of 4%, would threaten containment integrity with a further pressure spike from a hydrogen burn. Rapid unexplained loss of containment pressure which is not directly attributable to containment spray or condensation effects following an initial pressure increase indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

1-10

1.5.15 1-10 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUREG/BR-0150, USNRC RTM-92, Response Technical Manual, Volume 1 Rev. 2, October 1992
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.16 1-11

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Significant Radioactive Inventory In Containment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr or RU-149 > 8.7E+09 mrem/hr*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The readings associated with RU-148 and RU-149 are values which indicate significant fuel damage well in excess of the EAL associated with loss of the Fuel Clad Barrier. A major release of radioactivity requiring offsite protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant. Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a "Potential Loss" of containment, such that a General Emergency declaration is warranted. NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates that such conditions do not exist when the amount of clad damage is less than 20%. Hence, these radiation monitor readings correspond to 20% fuel clad damage.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-11

1.5.17 1-12

APP MODE: MODES 1 - 4	*CLASS:* N/A
CATEGORY: [F] Fission Product Barrier Degradation	
NUMARC/NESP-007 INITIATING CONDITION: 6. Core Exit Thermocouples	

PVNGS EMERGENCY ACTION LEVEL (EAL):
POTENTIAL LOSS: *CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored w/i 15 min.*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 5

TECHNICAL BASIS:
Restoration implied in the EAL assumes that function restoration procedures are considered effective if temperatures are decreasing or if vessel water level is increasing. The conditions mentioned in the EAL represent a core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with CET EALs in the Fuel Clad Barrier and leakages in the RCS Barrier, this EAL would result in the declaration of a General Emergency. There exists no success path for this event if function restoration procedures are ineffective.

Severe accident analyses *(e.g., NUREG-1150)* have concluded that function restoration procedures can arrest core degradation within the reactor vessel in a significant fraction of the core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period to allow function restoration procedures to arrest the core melt sequence. Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Operations Director/Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be, ineffective. The reactor vessel level identified in the EAL is consistent with application to PVNGS. *(See the Technical Basis for the Fuel Clad Barrier "Potential Loss" EAL on reactor vessel water level.)*

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:
PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-12

1.5.18 1-13

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Containment Isolation Valve Status After Containment Isolation

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The PVNGS setpoint for a Containment Isolation Actuation Signal *(CIAS)* is 3.0 psig containment pressure. The likely cause for elevated containment pressure is a LOCA into containment. The containment atmosphere will be contaminated to some degree by activity from the RCS. If both containment isolation valves which are required to close on a CIAS do not fully close, there will be an unmonitored release to the environment from the containment if it is determined that a downstream pathway to the environment exists. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

This EAL addresses an incomplete containment isolation that allows a direct release to the environment. It represents a loss of the Containment Barrier.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-13

1.5.19 1-14

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

4. SG Secondary Side Release With Primary To Secondary Leakage

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Release of contam. secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage*

LOCATION: Table 1: CONTAINMENT / Row 4

TECHNICAL BASIS:

The "Loss" EAL is based on steam generator tube leakage in excess of Tech Spec allowable S/G primary-to-secondary leakage in combination with a release of contaminated steam to the environment. Steam release may be due to a steam line break. It may also be due to operation of the main steam safety or atmospheric dump valves *(ADVs)*, or turbine-driven AF pump exhaust. These methods may release steam to the environment as a normal factor of operation. In the case of a steam line break, the leakage to the environment may not be isolable. If the release of steam is from turbine-driven AF pump exhaust, isolation will likely result in loss of steam generator feed with eventual loss of core cooling as the steam generators boil dry. The Main Steam safety or atmospheric dump valves are commonly used as a primary means of RCS heat removal during post-trip natural circulation cooling of the core. Under these conditions, a release of steam from the Main Steam safety or atmospheric dump valves cannot be isolated without loss of core cooling or risking a possible overpressure condition in the steam generators. It is likely that there will be some contamination of the steam released to the environment by leakage from the primary coolant system. This release will be unmonitored. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ08, Steam Generator Tube Leak, Rev. 00.08
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-14

1.5.20 1-15

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

8. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier*

LOCATION: Table 1: CONTAINMENT / Row 6

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Containment Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007. Methodology for Development of Emergency Action Levels, Rev. 2

1-15

1.5.21 2-1

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU1 Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers for greater than 15 minutes.
AND
b. At least (site-specific) emergency generators are supplying power to emergency busses.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power *(Station Blackout).* Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-1

1.5.22 2-2 (page 1 of 2)

APP MODE: **MODES 5 - 6, Defueled** ***CLASS:*** **NUE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU7 Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for Greater Than 15 Minutes.
1. Either of the following conditions exist:
a. Unplanned loss of Vital DC power to required DC busses based on (site-specific) bus voltage indications.
AND
b. Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:
The purpose of this EAL is to recognize a loss of DC power compromising the ability to monitor and control the removal of decay heat during Cold Shutdown or Refueling operations. This EAL is anticipatory in as much as the operating crew may not have necessary indication and control of equipment needed to respond to the loss. "Unplanned" is included in this EAL to preclude the declaration of an emergency as a result of planned maintenance activities. The intention is that the loss of the operating *(OPERABLE)* train is to be considered when the other redundant train may be out of service.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

2-2

1.5.23 2-2 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.24 2-3 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA5 AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout.
1. Either of the following conditions exist: (a and b)
a. Loss of Power to <site-specific> Transformers for Greater Than 15 Minutes, AND
b. Onsite Power Capability has been Degraded to one (Train of) Emergency Bus(ses) Powered From a Single Onsite Power Source due to the Loss of: <site-specific list>

PVNGS EMERGENCY ACTION LEVEL (EAL):
Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition:

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG)
OR
Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR)

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:
This EAL is intended to provide an escalation from EAL [SU1-1]. The condition indicated is the degradation of the offsite and onsite power systems such that any additional single failure would result in a total loss of power to both essential buses. This condition could occur due to a loss of offsite power with a concurrent failure of one emergency diesel generator to supply power to its respective emergency bus. Another related condition could be the loss of all offsite power to the essential buses from the ESF Transformers and loss of both emergency diesel generators with only one train of emergency buses being backfed from the unit main generator, or the loss of both emergency diesel generators with only one train of emergency buses being backfed from offsite power. The subsequent loss of this single power source would escalate the event to an SAE in accordance with EAL [SS1-1]. Control Room indications representing this condition would be all power supplies to both essential buses unavailable except for a single power source such that if lost, would establish the single failure vulnerability. Since PVNGS is a multi-unit site, credit is allowed for a cross-tie of another unit's emergency diesel generator, provided that the evolution is being directed by plant procedures. However, the impact of this condition on other safety functions must be considered.

2-3

1.5.25 2-3 (page 2 of 2)

NUMARC DEVIATION:
The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions; as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

This EAL does not address specific Control Room annunciator indications for this condition due to the inconsistencies associated with it. Control Room annunciation is utilized in analyzing the condition, as directed by plant annunciator response procedures which direct subsequent actions based on priorities established within those procedures.

SOURCE DOCUMENT:

41AL-1RK1A, Panel B01A Alarm Responses, Rev. 03.01
41AL-1RK1B, Panel B01B Alarm Responses, Rev. 02.08
41AL-1RK1C, Panel B01C Alarm Responses, Rev. 03.19
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.26 2-4

APP MODE: MODES 5 - 6, Defueled	CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses During Cold Shutdown Or Refueling Mode.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within 15 minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. When in Cold Shutdown, Refueling, or a Defueled Mode, the event can be classified as an ALERT because of the significantly reduced decay heat, lower RCS temperature and pressure, and the increased time to restore one of the emergency buses relative to that specified for the SAE EAL. Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-4

1.5.27 2-5

APP MODE: MODES 1 - 4	***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within (site-specific) minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. Prolonged loss of all AC power will cause core uncovering and loss of containment integrity. Thus, this event can escalate to a General Emergency. The fifteen minute time duration is selected to exclude transient and momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-5

1.5.28 2-6

APP MODE: **MODES 1 - 4** | ***CLASS:*** **SAE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS3 Loss of All Vital DC Power.
1. Loss of All Vital DC Power based on (site-specific) bus voltage indications for greater than 15 minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all DC power compromises the ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the Reactor Coolant System. Fifteen minutes is selected as a threshold to exclude transient and momentary power losses.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-6

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APP MODE: MODES 1 - 4

CLASS: GE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG1 Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power.
1. Prolonged loss of all offsite and onsite AC power as indicated by:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency diesel generators to supply power to emergency busses.
AND
c. At least one of the following conditions exist:
Restoration of at least one emergency bus within (site-specific) hours is *NOT* likely
OR
(Site-Specific) Indication of continuing degradation of core cooling based on Fission Product Barrier monitoring.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4
AND
Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:
Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. Prolonged loss of all AC power will lead to loss of fuel clad, RCS, and containment. The 4.5 hour time duration to restore AC power is based on the site blackout coping analysis performed in conformance with 10 CFR 50.63 and Regulatory Guide 1.155, Station Blackout. Appropriate allowance for offsite emergency response exists. Although this EAL may be redundant to Fission Product Barrier EAL*(s)*, its inclusion is necessary to better assure timely recognition and emergency response.

2-7

1.5.30 2-7 (page 2 of 2)

TECHNICAL BASIS (continued...):

The specification of this EAL assures that in the unlikely event of a prolonged loss of power to both essential buses, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one emergency bus is based on a realistic appraisal of the situation, since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Operations Director/Emergency Coordinator a reasonable idea of how quickly *(s)*he may need to declare a General Emergency based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is IMMINENT?

2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented?

Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Operations Director/Emergency Coordinator judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

Combustion Engineering, Inc., Evaluation of a Prolonged Station Blackout with Plant Recovery, Prepared for Arizona Public Service Company, MAR 1989
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.31 3-1 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-1

1.5.32 3-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-143 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-}06\ \frac{\text{sec}}{\text{m}^3}\right)\left(111000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 6.12\text{E-}04\ \text{uCi / cc}$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

<u>NUMARC DEVIATION</u>:
Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.
Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.33 3-2 (page 1 of 2)

APP MODE: **MODES 1 - 6** | ***CLASS:*** **NUE**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure): (site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-2

1.5.34 3-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological critena is also used where allowed.

The following calculation is used to derive the RU-145 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(43500\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.56\text{E-03 uCi / cc}$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
43500 = *Maximum process flow for the Fuel Bldg. in CFM*
1750 = Equivalent Total Body Dose in mrem/yr per µCi/m^3 using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.35 3-3 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

3-3

1.5.36 3-3 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.37 3-4

APP MODE: MODES 1 - 6 *CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 0.1 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into a Notification of Unusual Event *(NUE)*.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-4

1.5.38 3-5

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
4. Valid Direct Area Radiation Monitor readings increases by a factor of 1000 over normal * levels.
* Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit

(normal levels comprise the highest reading in the past 24 hours excluding the current peak value)

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses unplanned increases in in-plant radiation levels that represent a degradation in the control of radioactive material, and represent a potential degradation in the level of safety of the plant. Possible events which could lead to loss of control of radioactive material of this magnitude include, but are not limited to:

w Spent resin transfer with a resin spill or resin hose break
w Waste Gas Decay Tank leak or rupture

If the increases impair safe plant operations, then this EAL escalates to an ALERT.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-5

1.5.39 3-6

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
1. (Site-Specific) indication of uncontrolled water level decrease in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water.
2. Uncontrolled water level decrease in the spent fuel pool and fuel transfer canal with all irradiated fuel assemblies remaining covered by water.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

These events tend to have long lead times relative to potential for radiological release outside the Site Boundary. Thus, impact to public health and safety is very low.

In light of reactor cavity seal failure incidents at two different PWRs and loss of water in the spent fuel pool/fuel transfer canal at a BWR, all occurring since 1984, explicit coverage of these types of events is appropriate, given their potential for increased doses to plant staff. Classification as an NUE is warranted as a precursor to a more serious event.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers. June 1993

3-6

1.5.40 3-7

APP MODE: MODES 1 - 6 — ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.
2. (Site-Specific) coolant sample activity value indicating fuel clad degradation greater than Technical Specification allowable limits.

PVNGS EMERGENCY ACTION LEVEL (EAL):

RCS specific activity > Technical Specification allowable limits

LOCATION: Table 3: RADIOLOGICAL / Row 7

TECHNICAL BASIS:

This EAL is considered to reflect a potential degradation in the level of safety of the plant and a potential precursor to more serious problems. The Technical Specification limit is set to ensure that following a steam generator tube rupture accident in conjunction with an assumed steady state steam generator leak rate of 1 gpm and a concurrent loss of offsite electrical power, the 2-hour dose rate to the public will not exceed ODCM limits for exposure to the public. The action required is a plant shutdown with T_C < 500°F within 6 hours for activity exceeding 100/E-Bar. With the specific activity of the coolant exceeding 1.0 µCi/gm Dose Equivalent I^{131} for more than 48 hours during one continuous time interval, or exceeding a limit line specified in Technical Specifications Figure 3.4-1, the action required is plant shutdown with T_C < 500°F within 6 hours. The permission to operate for a limited period of time with the primary coolant activity greater than 1.0 µCi/gm, but below the curve in Technical Specification Figure 3.4-1, accommodates possible Iodine spiking which may accompany changes in reactor thermal power.

NUMARC DEVIATION:

NONE. PVNGS Technical Specifications depicts values associated with RCS specific activity.

SOURCE DOCUMENT:

Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-7

1.5.41 3-8 (page 1 of 2)

APP MODE: **MODES 1 - 6** *CLASS:* **ALERT**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer
OR
Valid
dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-8

1.5.42 3-8 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Plant Vent reading, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\ \left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\ \left(111000\ \text{cfm}\right)\ \left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.22\text{E-02 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT. and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.43 3-9 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period. then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-9

1.5.44 3-9 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20 and by a factor which is the ratio of the normal process flowrate to the Essential ventilation process flowrate for the Fuel Building Exhaust. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Fuel Bldg. Exhaust, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(12000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.13\text{E-01 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
12000 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.45 3-10 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 20. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

3-10

1.5.46 3-10 (page 2 of 2)

NUMARC DEVIATION (continued...):

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.47 3-11

APP MODE: MODES 1 - 6 | *CLASS:* ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 1.0 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into an ALERT.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.48 3-12 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA3 Release of Radioactive Material or Increases in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown
1. Valid (site-specific) radiation monitor readings GREATER THAN 15 mR/hr in areas requiring continuous occupancy to maintain plant safety functions:
- (Site-specific) list
2. Valid (site-specific) radiation monitor readings GREATER THAN <site specific> values in areas requiring infrequent access to maintain plant safety functions.
- (Site-specific) list
NOTE: The Emergency Director should determine the cause of the increase in radiation levels and review other ICs for applicability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are:

(1) > 15 mR/hr:
- RU-18 Control Room
- RU-18 Secondary Alarm Station

OR

(2) > 5000 mR/hr:
- RU-18 Remote Shutdown Panels
- RU-155 Main Steam Support Structure
- RU-153c Aux Bldg, 100' East
- RU-23 Chemistry Hot Laboratory
- RU-19 Fuel Building

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses increased radiation levels that impede necessary access to operating stations, or other areas containing equipment which must be operated manually, in order to maintain safe operation or perform a safe shutdown. It is this impaired ability to operate the plant that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the increase inradiation levels is not a concern of this EAL. The Emergency Coordinator must consider the source or cause of the increased radiation levels and determine if any other EAL may be involved. For example, a dose rate of 15 mrem/hr in the Control Room may be a problem in itself. However, the increase may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, an SAE or GE may be indicated by the fission product barrier matrix EALs.

3-12

1.5.49 3-12 (page 2 of 2)

TECHNICAL BASIS (continued...):

At PVNGS, this EAL could result in a declaration of an ALERT at one unit due to a radioactivity release or radiation shine resulting from a major accident at another unit. This is appropriate if the increase impairs operations at the operating unit.

This EAL is not meant to apply to increases in the containment dome radiation monitors (*RU-148 and/or RU-149)*, as these are events which are addressed in the Fission Product Barrier Reference EALs. Nor is it intended to apply to anticipated temporary increases due to planned events *(e.g., incore detector move-ment, radwaste container movement, depleted resin transfers, etc.).*

Areas requiring continuous occupancy include the Control Room and the Secondary Alarm Station. The Radwaste Control Room is not determined to require continuous occupancy because radwaste systems are not in use following accident situations where dose rates may escalate beyond normal levels per the SER, Chapter 22, 11.B.2. The value of 15 mrem/hr is derived from the General Design Criteria-19 *(GDC-19)* value of 5 rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, Clarification of TMI Action Plan Requirements, provides that the 15 mrem/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30-day duration implies an event potentially more significant than an ALERT.

Areas requiring infrequent access are those which house equipment that do/may require manual operation to maintain safe plant operations or perform a safe plant shutdown. The Remote Shutdown Panels Area must be manned under adverse Control Room conditions and is required for plant shutdown. The other areas listed in the EAL are those identified in the Unit 3 PASS Licensing Checklist and comprises areas needed for access by plant personnel under adverse radiological conditions to perform manual operations required by plant operating procedures. For areas requiring infrequent access, the 5000 mrem/hr value is based on radiation levels which result in exposure control measures intended to maintain doses within normal occupational exposure guidelines and limits *(i.e., 10 CFR 20)*, and in doing so, will impede necessary access.

The radiation monitors associated with this EAL read in Roentgen and mR, rather than rem and mrem. Surveys of areas requiring access are recorded in mrem. For nuclear power plant gamma rays *(excluding N-16)*, mrem and mR are approximately equal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix-R Operational Considerations, 29 JUL 93
ANPP Post-Accident Sampling System Licensing Technical Review Response Justification, 09 AUG 85
Engineering Calculation 03-NC-SS-A01, Post-Accident Doses, 28 JUN 87
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUREG-0857, Safety Evaluation Report Related to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2, and 3, NOV 81
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2a

1.5.50 3-13 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **ALERT**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA2 Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.
1. A (site-specific setpoint) alarm on one or more of the following radiation monitors: (site-specific monitors)
Refuel Floor Area Radiation Monitor
Fuel Handling Building Ventilation Monitor
Fuel Bridge Area Radiation Monitor
2. Report of visual observation of irradiated fuel uncovered.
3. Water level less than (site-specific) feet for the Reactor Refueling Cavity that will result in Irradiated Fuel Uncovering.
4. Water level less than (site-specific) feet for the Spent Fuel Pool and Fuel Transfer Canal that will result in Irradiated Fuel uncovering.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal (i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication) such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur
AND
Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage, which is not applicable to PVNGS. NUREG-0818, Emergency Action Levels for Light Water Reactors, forms the basis for these EALs.

There is time available to take corrective actions, and there is little potential for substantial fuel damage. In addition, NUREG/CR-4982, Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82, July 1987, indicates that even if corrective actions are not taken, no prompt fatalities are predicted, and that risk of injury is low. In addition, NRC Information Notice No. 90-08, KR-85 Hazards from Decayed Fuel, presents the following in its discussion:

3-13

1.5.51 3-13 (page 2 of 2)

TECHNICAL BASIS (continued...):

In the event of a serious accident involving decayed spent fuel, protective actions would be needed for personnel on site. while offsite doses *(assuming an exclusion area radius of one mile from the plant site)* would be well below the Environmental Protection Agency's Protective Action Guides. Accordingly, it is important to be able to properly survey and monitor for Kr-85 in the event of an accident with decayed spent fuel.

Licensees may wish to reevaluate whether Emergency Action Levels specified in the emergency plan and procedures governing decayed fuel-handling activities appropriately focus on concern for onsite workers and Kr-85 releases in areas where decayed spent fuel accidents could occur, for example, the spent fuel pool working floor. Furthermore, licensees may wish to determine if emergency plans and corresponding implementing procedures address the means for limiting radiological exposures of onsite personnel who are in other areas of the plant. Among other things, moving onsite personnel away from the plume and shutting off building air intakes downwind from the source may be appropriate.

The 132.5 ft. elevation *(17.5 ft. above the fuel)* is based on a level corresponding to a point below which siphoning of water in the Spent Fuel Pool would cease. Any further uncontrolled water level decrease beyond this point would indicate major problems with sealing areas, signifying a potential radiation dose consequence to plant personnel.

Thus, an ALERT Classification for this event is appropriate. Escalation, if appropriate, would occur via the Radiological Category or the Emergency Coordinator judgment.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Regulatory Guide 1.25, Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors, Rev. 0, 23 MAR 72
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Section 9.1.4.6
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Bechtel Calculation 13-NC-ZY-203, Fuel Handling Accident in the Fuel Building, Rev. 4
Combustion Engineering Study 14273-RCE-404, Implications of Cavity Seal Failure, Rev. 0
INPO SOER 85-01, Reactor Cavity Seal Failure
PVNGS Procedure 41AL-1PC01, Fuel Pool Cooling and Cleanup System Local Alarm Panel 1-J-PCN-E02 Responses, Rev. 03.03
PVNGS Procedure 41AO-1ZZ26, Irradiated Fuel Damage, Rev. 03.01
PVNGS Procedure 41AO-1ZZ53, Loss of Refueling Pool and/or Spent Fuel Pool Level, Rev. 02.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.52 3-14 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):

(site-specific list)

Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:

Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 μCi/cc sustained for 15 minutes or longer

OR

Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary

OR

Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE.

3-14

1.5.53 3-14 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.54 3-15 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **SAE**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE.

3-15

1.5.55 3-15 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.56 3-16 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

3. Valid dose assessment capability indicates dose consequences greater than 100 mR whole body or 500 mR child thyroid.
4. Field survey results indicate site boundary dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 500 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

OR

Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

3-16

1.5.57 3-16 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.58 3-17 (page 1 of.7)

APP MODE: MODES 1 - 6

CLASS: GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem Total Effective Dose Equivalent or 5 rem thyroid Committed Dose Equivalent. This is consistent with the emergency class descnption for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-17

1.5.59 3-17 (page 2 of 7)

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The following calculation demonstrates that EALs of 2.2 µCi/cc on the Plant Vent monitor and 19.6 µCi/cc on the Fuel Building Vent monitor will produce, for a 1-hour exposure, EPA-400 PAG values of *(a)* 1 rem TEDE at the Site Boundary, or *(b)* 5 rem thyroid CDE, without exceeding the other EPA-400 PAG value. Under NUMARC/NESP-007, these values will be used as EALs for General Emergency. The corresponding EAL values for Site Area Emergency are 10% of the General Emergency values.

For the Fuel Building Vent monitor, a reading of 1.56E-03 µCi/cc or greater will cause an automatic reduction in flow rate of 43,500 cfm to a design value of 12,000 cfm *(provided both trains of essential ventilation are in operation)*. This concentration is one-half the EAL for Unusual Event. Therefore, a flow rate of 12,000 cfm will be used for this calculation. Bringing essential ventilation online also results in charcoal filtration of the Fuel Building Vent effluent, which consists of the ventilation exhausts from the Fuel Building as well as the Auxiliary Building below ground level. This filtration results in an Iodine reduction factor of 20, that is, a charcoal filter efficiency of 95%.

The design maximum flow rate for the Plant Vent is 111,000 cfm without the refueling purge in operation. Radiation Monitoring System *(RMS)* alarm setpoints do not reduce flow rate to the Plant Vent. Charcoal filtration is brought online through operator actions for the several flows to the Plant Vent which have a potential Iodine source term. This action provides an Iodine reduction factor of 20. RMS alarm setpoints and the EALs stated as concentrations in the Plant Vent exhaust and the Fuel Building Vent exhaust are based on noble gas concentration.

Based on the foregoing, the methodology of this calculation will be to calculate TEDE and thyroid CDE at the Site Boundary for a one-hour release with a default atmospheric dispersion coefficient *($c/Q = 8.91E\text{-}06\ sec/m^3$)*, which is the highest sector annual average c/Q value from the ODCM. The calculation for the Plant Vent release uses 2.2 µCi/cc noble gas for the accident type with the highest Iodine/noble gas *(I/NG)* ratio and 95% filter efficiency for Iodine. This process would then be repeated for releases from the Fuel Building Vent at 1.96E+01 µCi/cc.

1.5.60 3-17 (page 3 of 7)

TECHNICAL BASIS (continued...):

The Iodine/noble gas *(I/NG)* ratios at time = zero effective age are obtained from MESOREM, Jr.:

Plant Vent Releases I/NG

1. Isolated Containment *(100% LOCA / with iodine filtered)* 1.9E-02
2. Steam Generator Tube Rupture with 1% Failed Fuel 7.5E-05
3. Steam Generator Tube Rupture with 100% Failed Fuel 5.1E-04
4. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
5. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
6. Waste Gas Decay Tank Rupture 0
7. Fuel Handling Accident 2.5E-04

Fuel Building Vent Releases I/NG

1. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
2. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
3. Fuel Handling Accident 2.5E-04

For both vent pathways, the Loss of Coolant Accident *(LOCA)* with 100% Failed Fuel has the highest I/NG ratio *(maximum thyroid CDE)*. Noble gas release rate is fixed at the RMS reading specified *(Plant Vent = 2.2 µCi/cc, Fuel Building Vent = 19.6 µCi/cc)* multiplied by the process flow rate *(Plant Vent = 111,000 cfm, Fuel Building Vent = 12,000 cfm)*. The source term, in units of µCi/sec., is the same for both vent pathways, given these flow rates, concentrations, and this accident type *(i.e., 19.6/2.2 = 111,000/12,000)*.

Use of the LOCA with 100% Failed Fuel is consistent with PVNGS UFSAR Section 1.8, "Regulatory Guide 1.52 Response", in which this accident type is postulated for the design basis of the Control Building Essential Ventilation System. The same UFSAR Section also postulates the Fuel Handling Accident for the design basis of the Fuel Building Essential Ventilation System. By inspection of the above table, it can be seen that the Fuel Handling Accident has a lower I/NG ratio than the LOCA with 100% Failed Fuel. Therefore, given that the same accident type is limiting for both vent pathways, it is not necessary to calculate doses from both vents; they would be the same.

The source term or release rate is calculated in the following table per the equation:

Ci/sec = (µCi/cc) (ft^3/min) (472 cc/sec per ft^3/min) (1E-06 Ci/µCi)
= (µCi/cc) (1.07E+05) (472) (1E-06)
= (µCi/cc) (50.5)

1.5.61 3-17 (page 4 of 7)

TECHNICAL BASIS (continued...):

The isotopic mix at time = zero effective age is obtained from MESOREM, Jr.:

Nuclide	100% LOCA mix *(%)*	Source Term (µCi/cc)	Release Rate (Ci/sec.)
I-131	12.1	6.0E-03	3.0E-01
I-132	12.4	6.0E-03	3.0E-01
I-133	24.8	1.2E-02	6.1E-01
I-134	27.1	1.3E-02	6.6E-01
I-135	23.6	1.1E-02	5.6E-01
Total Iodine	100.0	4.8E-02 *	2.4E+00
Kr-83m	0.0	0	0
Kr-85m	3.3	7.5E-02	3.8E+00
Kr-85	0.1	2.2E-03	1.1E-01
Kr-87	5.6	1.3E-01	6.6E+00
Kr-88	8.2	1.8E-01	9.1E+00
Kr-89	10.3	2.2E-01	1.1E+01
Xe-131m	0.1	2.2E-03	1.1E-01
Xe-133m	0.0	0	0
Xe-133	21.6	4.8E-01	2.4E+01
Xe-135m	6.1	1.4E-01	7.1E+00
Xe-135	5.1	1.1E-01	5.6E+00
Xe-137	20.0	4.4E-01	2.2E+01
Xe-138	19.6	4.3E-01	2.2E+01
Total NG	100.0	2.2E+00	1.1E+02

* Based on the I/NG ratio of 2.2E-02 and NG concentration of 2.2 µCi/cc

$CEDE_{inhalation} = \hat{A}_{i=1\ to\ n}\ (DCF)_i\ (c/Q)\ (Release\ Rate)_i\ (Unit\ Conversion)$

where:

DCF_i= Dose Conversion Factor from EPA-400, Table 5-4, for nuclide "i", in rem-cc per µCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

(Release Rate)$_i$ is as was just calculated, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

1.5.62 3-17 (page 5 of 7)

TECHNICAL BASIS (continued...):

Nuclide	DCF_i	c/Q	Release Rate	$CEDE_i$
I-131	3.9E+04	8.91E-06	3.0E-01	1.0E-01
I-132	4.6E+02	8.91E-06	3.0E-01	1.3E-03
I-133	7.0E+03	8.91E-06	6.1E-01	3.8E-02
I-134	1.6E+02	8.91E-06	6.6E-01	9.4E-04
I-135	1.5E+03	8.91E-06	5.6E-01	7.5E-03
Noble Gases	0	8.91E-06	as given	0

$CEDE_{inhalation}$ = 1.5E-01 rem/hour

External EDE = $\hat{A}_{i=1 \text{ to } n}$ $(DCF)_i$ (c/Q) (Release Rate)$_i$ (Unit Conversion)

where:

DCF_i= Dose Conversion Factor from EPA-400, Table 5-3, for nuclide "i", in rem-cc per mCi-hour

c/Q = 8.91E-06 seconds/meter^3. as discussed previously

(Release Rate)$_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3.

Nuclide	DCF_i	c/Q	Release Rate	External EDE_i
I-131	2.2E+02	8.91E-06	3.0E-01	5.9E-04
I-132	1.4E+03	8.91E-06	3.0E-01	3.7E-03
I-133	3.5E+02	8.91E-06	6.1E-01	1.9E-03
I-134	1.6E+03	8.91E-06	6.6E-01	9.4E-03
I-135	9.5E+02	8.91E-06	5.6E-01	4.7E-03
Kr-83m	0	8.91E-06	0	0
Kr-85m	9.3E+01	8.91E-06	3.8E+00	3.1E-03
Kr-85	1.3E+00	8.91E-06	1.1E-01	1.3E-06
Kr-87	5.1E+02	8.91E-06	6.6E+00	3.0E-02
Kr-88	1.3E+03	8.91E-06	9.1E+00	1.1E-01
Kr-89	1.2E+03	8.91E-06	1.1E+01	1.2E-01
Xe-131m	4.9E+00	8.91E-06	1.1E-01	4.8E-06
Xe-133m	1.7E+01	8.91E-06	0	0
Xe-133	2.0E+01	8.91E-06	2.4E+01	4.3E-03
Xe-135m	2.5E+02	8.91E-06	7.1E+00	1.6E-02
Xe-135	1.4E+02	8.91E-06	5.6E+00	7.0E-03
Xe-137	1.1E+02	8.91E-06	2.2E+01	2.2E-02
Xe-138	7.1E+02	8.91E-06	2.2E+01	1.4E-01

External EDE = 4.7E-01 rem/hour

1.5.63 3-17 (page 6 of 7)

TECHNICAL BASIS (continued...):

A "depleted c/Q" could be used for the Iodine isotopes; the resulting reduction in external EDE would be small.

In MESOREM Jr. Mode-A dose projections, CEDE is from inhalation only and external EDE is from immersion only; that is, CEDE from ingestion is calculated only in Mode-B, and external EDE from deposition is used only in PAG calculations and not EAL calculations. Particulate source term is also reserved for Mode-B projections. Therefore, for purposes of Initial Phase EALs:

$TEDE = CEDE_{inhalation} + \text{External EDE}$

= 1.5E-01 + 4.7E-01

= 6.2E-01 rem/hour

Conclusion 1:

Based on a Plant Vent concentration (noble gas) of 2.2 μCi/cc or a Fuel Building Vent concentration of 19.6 μCi/cc, the TEDE PAG is not reached for the postulated accident type.

The thyroid CDE will now be calculated for a Plant Vent concentration (noble gas) of 2.2 μCi/cc to show whether this proposed EAL value reaches or exceeds the thyroid CDE PAG.

$CDE = \hat{A}_{i=1\ to\ n} (DCF)_i\ (c/Q)\ (\text{Release Rate})_i\ (\text{Unit Conversion})$

where:

DCF_i= Dose Conversion Factor from EPA-400, Tables 5-2 and 5-4, for nuclide "i", in rem-cc per μCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(\text{Release Rate})_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 μCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	Thyroid CDE_i
I-131	1.3E+06	8.91E-06	3.0E-01	3.5E+00
I-132	7.7E+03	8.91E-06	3.0E-01	2.0E-02
I-133	2.2E+05	8.91E-06	6.1E-01	1.2E+00
I-134	1.3E+03	8.91E-06	6.6E-01	7.6E-03
I-135	3.8E+04	8.91E-06	5.6E-01	1.9E-01

Thyroid CDE = 4.9 rem/hour

1.5.64 3-17 (page 7 of 7)

TECHNICAL BASIS (continued...):

Conclusion 2:

Based on a Plant Vent concentration (noble gas) of 2.2 μCi/cc or a Fuel Building Vent concentration of 19.6 μCi/cc, the Thyroid CDE PAG is reached (a Plant Vent concentration of 2.3 μCi/cc would give a result slightly over 5.0 rem/hour) for the postulated accident type.

NOTE: External EDE rate, TEDE rate, and thyroid CDE rate are calculated using MESOREM, Jr. Total Body Dose rate is calculated using methodology in PVNGS Procedure 74RM-9EF41.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.65 3-18 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-18

1.5.66 3-18 (page 2 of 2)

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.67 3-19 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **GE**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
3. Valid dose assessment capability indicates dose consequences greater than 1000 mR whole body or 5000 mR child thyroid.
4. Field survey results indicate site boundary dose rates exceeding 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 5000 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation
OR
Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1).*

3-19

1.5.68 3-19 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.69 4-1

APP MODE: MODES 1 - 4	*CLASS:* NUE
CATEGORY: [S] System Malfunction	

NUMARC/NESP-007 INITIATING CONDITION:

SU5 RCS Leakage.
1. The following conditions exist:
a. Unidentified or pressure boundary leakage greater than 10 gpm.
OR
b. Identified leakage greater than 25 gpm.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unidentified or pressure boundary leakage > 10 gpm in Modes 1-4

Identified leakage > 25 gpm in Modes 1-4

LOCATION: Table 4: LEAKAGE / Row 1, Row 2

TECHNICAL BASIS:

This EAL is included as an NUE because it may be a precursor to more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified or pressure boundary leakage is selected as it is observable with normal Control Room indications. Lesser values must generally be determined through time-consuming surveillance tests *(e.g., mass balances).* The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. Either value exceeded requires immediate classification *(i.e., Tech Spec LCO allowable Action Statement time limits are not applicable).*

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

4-1

1.5.70 5-1 (page 1 of 2)

APP MODE: MODES 1 - 4 *CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU3 Unplanned Loss of Most or All Safety System Annunciation or Indication in The Control Room for Greater Than 15 Minutes
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. Compensatory non-alarming indications are available.
AND
c. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
d. Annunciator or Indicator loss does not result from planned action.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This and other related EALs are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.)*.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities. "Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-1

1.5.71 5-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

This EAL applies to Operating Modes 1-4 only, due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.72 5-2

APP MODE: MODES 1 - 4

CLASS: NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU2 Inability to Reach Required Shutdown Within Technical Specification Limits.
1. Plant is not brought to required operating mode within (site-specific) Technical Specifications LCO Action Statement Time.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Limiting Conditions of Operation *(LCOs)* require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by PVNGS Technical Specifications requires a one-hour report under 10 CFR 50.72*(b)*. Non-emergency events. The plant is within its safety envelope when being shut down within the allowable LCO Action Statement time limits in the Technical Specifications. An immediate Notification of Unusual Event is required when the plant is not brought to the required operating mode within the allowable LCO Action Statement time limits in the Technical Specifications. Declaration of an NUE is based on the time at which the LCO-specified Action Statement time period elapses under the PVNGS Technical Specifications and is not related to how long a condition may have existed. Other required Technical Specification shutdowns that involve precursors to more serious events are addressed by other specific EALs.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-2

1.5.73 5-3

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU6 Unplanned Loss of All Onsite or Offsite Communications Capabilities.
1. Either of the following conditions exist:
a. Loss of all (site-specific list) onsite communications capability affecting the ability to perform routine operations.
OR
b. Loss of all (site-specific list) offsite communications capability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Row 3: *Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN pnmary, and NAN radio*

Row 4: *Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system*

LOCATION: Table 5: MALFUNCTIONS / Row 3, Row 4

TECHNICAL BASIS:

The purpose of this EAL is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate problems with offsite authorities. The loss of offsite communications ability is significantly more compre-hensive than the condition addressed by 10 CFR 50.72.

The offsite communications loss encompasses the loss of all means of communications with offsite authorities. This EAL is intended to be used only when extraordinary means are being utilized to make communications possible *(relaying of information from radio transmissions, individuals being sent to offsite locations, or any other method entailing communications with offsite authorities made possible from a location other than the Control Room / STSC).*

The onsite communications loss encompasses the loss of all means of routine communications.

NUMARC DEVIATION:

NONE. NUMARC/NESP-007 is not specific as to locations from which communications capabilities with offsite agencies are not possible. Since communications with offsite agencies are customarily originated from within the Control Room / STSC, PVNGS does not deviate from normal practices in this area.

SOURCE DOCUMENT:

5-3

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.74 5-4 (page 1 of 2)

APP MODE: MODES 1 - 2 | ***CLASS:*** ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful.
1. (Site-specific) indication(s) exist that indicate that reactor protection system setpoint was exceeded and automatic scram did not occur, and a successful manual scram occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2

(manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS bus from the Control Room)

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient and thus, the plant safety has been compromised and design limits of the fuel may have been exceeded. An ALERT is indicated because conditions exist that lead to potential loss of fuel clad or RCS. Under these conditions, the ALERT is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Reactor Protection System setpoint being exceeded *(rather than limiting safety system setpoint being exceeded)* is specified here because failure of the automatic protection system is the issue. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons)*. Failure of a manual trip would escalate the event to an SAE.

An ALERT classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

5-4

1.5.75 5-4 (page 2 of 2)

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.76 5-5 (page 1 of 2)

APP MODE: MODES 5 - 6

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA3 Inability to Maintain Plant in Cold Shutdown.
1. The following conditions exist:
a. Loss of (site-specific) Technical Specification required functions to maintain cold shutdown.
AND
b. Temperature increase that either:
w Exceeds Technical Specification cold shutdown temperature limit
OR
w Results in uncontrolled temperature rise approaching cold shutdown technical specification limit.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

This EAL addresses complete loss of functions required for core cooling during Refueling and Cold Shutdown Modes.

This condition is based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal. A number of phenomena such as pressurization, vortexing, steam generator U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system *(SDC)* design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncovery can occur. NRC analyses show that sequences can cause core uncovery in 15 to 20 minutes and severe core damage within an hour after decay heat removal is lost. Under these conditions, RCS integrity is lost and fuel clad integrity is lost or potentially lost, which is consistent with an SAE classification. Indicators used as measurement for this EAL are those methods used by the plant in response to Generic Letter 88-17, which include Core Exit Thermocouples *(CETs)* and RCS water level monitoring. In addition, Radiation Monitoring System *(RMS)* readings may also be appropriate as an indicator of this condition.

5-5

1.5.77 5-5 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Uncontrolled" means that the system temperature increase is not the result of planned actions by the plant staff.

The EAL guidance related to the uncontrolled temperature rise is necessary to preserve the anticipatory philosophy of NUREG-0654 for events starting from temperatures much lower than the Cold Shutdown temperature limit.

NUMARC DEVIATION:

It is understood that if the plant is in conformance with Technical Specifications during operations within Cold Shutdown conditions, any functions required for OPERABILITY during this mode will be available to maintain Cold Shutdown. Hence, "Technical Specification required functions", as delineated in the NUMARC Example EAL, is redundant to that required for the specific mode and will be available for maintaining conditions required for that mode.

The Cold Shutdown temperature limit has been applied to the PVNGS EAL as a temperature of 210°F, which is the PVNGS Technical Specification upper temperature bounds of the modes applicable to this EAL.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.78 5-6 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA4 Unplanned Loss of Most or All Safety System Annunciation or Indication in Control Room With Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable.
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
c. Annunciator or Indicator loss does not result from planned action.
AND
d. Either of the following:
1. A significant plant transient is in progress.
OR
2. Compensatory non-alarming indications are unavailable.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL is intended to provide recognition of the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a transient. Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.)*.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities.

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

5-6

1.5.79 5-6 (page 2 of 2)

TECHNICAL BASIS (continued...):

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment. If both a major portion of the annunciation system and all computer monitoring are not available to the extent that the additional operating personnel are required to monitor indications, the ALERT is required.

Due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes, no EAL is indicated for these modes of operation.

This ALERT will be escalated to an SAE if the operating crew cannot monitor the transient in progress.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.80 5-7 (page 1 of 2)

APP MODE: MODES 1 - 2 | *CLASS:* SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful.
1. (Site-specific) indications exist that automatic and manual scram were not successful.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. An SAE is indicated because conditions exist that lead to imminent loss or potential loss of both fuel clad and RCS. Under these conditions, the SAE is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 µCi/gm Dose Equivalent I^{131}. Although this EAL may be viewed as redundant to the Fission Product Barrier Reference EAL, its inclusion is necessary to better assure timely recognition and emergency response. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons).*

A Site Area Emergency classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

5-7

1.5.81 5-7 (page 2 of 2)

NUMARC DEVIATION (continued...):

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.82 5-8

APP MODE: MODES 5 - 6

CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS5 Loss of Water Level in the Reactor Vessel That Has or Will Uncover Fuel in the Reactor Vessel.
1. Loss of Reactor Vessel Water Level as indicated by:
a. Loss of all decay heat removal cooling as determined by (site-specific) procedure.
AND
b. (Site-specific) indicators that the core is or will be uncovered.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 4xAO-xZZ22; Safety Analysis Operational Data)

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Under the conditions specified by this EAL, severe core damage can occur and Reactor Coolant System integrity may not be assured. This EAL covers sequences such as prolonged boiling following loss of decay heat removal. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

Site-specific indicators are not detailed in the EAL due to procedural direction delineating specific indications to be used in the assessment of reactor vessel water level. The Abnormal Operating Procedure also references the PVNGS Safety Analysis Operational Data Document to determine the associated core conditions based on time shutdown, vessel level, makeup flow rate, and core decay heat load.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ22, Loss of Shutdown Cooling, Rev. 06.14
PVNGS Safety Analysis Operational Data, Rev. 0
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.83 5-9

APP MODE: MODES 1 - 4	CLASS: SAE
CATEGORY: [S] System Malfunction	

NUMARC/NESP-007 INITIATING CONDITION:

SS4 Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown.
1. Complete loss of any (site-specific) function required for hot shutdown.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function (i.e., heat removal, reactivity control) or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL addresses complete loss of functions, including the ultimate heat sink and reactivity control, which are required to achieve or maintain Hot Shutdown. The Heat Removal Safety Function encompasses systems associated with removing heat from the core following plant shutdown, such as steam generators, which are required to be fed and steamed to be Operable, and the Shutdown Cooling System, which is required when steam generators are no longer needed or are unavailable for heat removal. The Reactivity Control Safety Function relies on shutdown margin requirements to ensure an unanticipated criticality situation does not occur, jeopardizing the RCS pressure boundary and possibly leading to core damage. Under these conditions, there is an actual major failure of a system intended for protection of the public. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-9

1.5.84 5-10 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS6 Inability to Monitor a Significant Transient in Progress.
1. The following conditions exist:
a. Loss of (site-specific) annunciators associated with safety systems.
AND
b. Compensatory non-alarming indications are unavailable.
AND
c. Indications needed to monitor (site-specific) safety functions are unavailable.
AND
d. Transient in progress.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available

LOCATION: Table 5: MALFUNCTIONS / Row 4

TECHNICAL BASIS:

This EAL and its associated EALs are intended to recognize the inability of the Control Room staff to monitor the plant response to a transient. An SAE is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor/Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-10

1.5.85 5-10 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

Indications needed to monitor safety functions necessary for protection of the public includes Control Room indications, computer generated indications *(i.e., QSPDS)*, and dedicated annunciation capability. The specific indications are those used to determine such functions as the ability to shut down the reactor, maintain the core cooled and in a coolable geometry, to remove heat from the core, to maintain the Reactor Coolant System intact, and to maintain containment integrity.

"Planned" actions are excluded from this EAL since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not an ameliorating factor.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system would audibly annunciate and the text associated with a particular parameter would change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it would also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.86 5-11 (page 1 of 2) .

APP MODE: MODES 1 - 2	***CLASS:*** GE
CATEGORY: [S] System Malfunction	

NUMARC/NESP-007 INITIATING CONDITION:

SG2 Failure of the Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is Indication of an Extreme Challenge to the Ability to Cool the Core.
1. (Site-specific) indications exist that automatic and manual scram were not successful.
AND
2. Either of the following:
a. (Site-specific) indications exist that the core cooling is extremely challenged.
OR
b. (Site-specific) indications exist that heat removal is extremely challenged.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to complete an automatic reactor shutdown (i.e., subcritical) and manual shutdown was not successful when in Modes 1-2
AND
CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons).*

Under the conditions of this and associated EALs, the efforts to bring the reactor subcritical have been unsuccessful and, as a result, the reactor is producing more heat than the maximum decay heat load for which the safety systems were designed. Although there are capabilities away from the reactor control console, such as emergency boration, the continuing temperature rise indicates that these capabilities are not effective. This situation could be a precursor for a core melt sequence.

The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200°F or that the reactor vessel water level is below the top of the active fuel.

5-11

1.5.87 5-11 (page 2 of 2)

TECHNICAL BASIS (continued...):

Another consideration is the inability to initially remove heat during the early stages of this sequence. If Essential Auxiliary Feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist.

In the event either of these challenges exist at a time that the reactor has not been brought below the power associated with the safety system design *(typically 3%)*, a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the GE declaration is intended to be anticipatory of the Fission Product Barrier Reference declaration to permit maximum offsite intervention time.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

1.5.88 6-1

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU2 Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection.
1. Fire in buildings or areas contiguous to any of the following (site-specific) areas not extinguished within 15 minutes of control room notification or verification of a control room alarm.
w (Site-specific) list

PVNGS EMERGENCY ACTION LEVEL (EAL):
Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:
The purpose of this EAL is to address the magnitude and extent of fires that may be potentially significant precursors to damage to safety systems. This excludes such items as fires within administration buildings, waste-basket fires, and other small fires of no safety consequence. This EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or areas that are not contiguous or immediately adjacent to plant vital areas. Verification of the alarm, in this context, means those actions taken in the Control Room to determine that the Control Room alarm is not spurious.,

NUMARC DEVIATION:
Site-specific areas are not delineated in the PVNGS EAL due to the ramifications involved when a fire affects the Protected Area. Because PVNGS is a three-unit site, and because a listing of specific areas which could be affected by a fire within buildings and/or areas immediately contiguous to this site-specific listing would defeat the purpose of possessing the ability to determine if the fire is affecting the Protected Area, the Shift Supervisor / Emergency Coordinator will be better served when a determination has to be made at the time whether the Protected Area is affected or not. The term "affecting major structures or areas within the Protected Area" is used here in the same context as is used elsewhere within the "HAZARDS" Event Category.

The 15 minute time period for a fire to be extinguished prior to declaration, in itself, allows for the exclusion of extremely small fires *(i.e., waste-basket fires, etc.)* which are easily extinguished, and sets a measurable standard which recognizes that any increase in the length of time a fire burns increases the risk of damage to equipment or injury to plant personnel.

A site-specific listing of possible Control Room annunciators that may be relevant to the diverse set of related fires appropriate to this EAL is not included within the text of the EAL due to procedural direction within the Control Room involving priorities established for operator response within those procedures. The annunciator responses *(several hundred, each specific to a designated area or component)* established for the Fire Alarm Terminal CRT are used in conjunction with the Pre-Fire Strategies Manual by Control Room and Fire Protection personnel in assessing and responding to fires within the facility.

SOURCE DOCUMENT:
PVNGS Pre-Fire Strategies Manual, Rev. 6
Fire Point/Zone Alarm Book
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-1

1.5.89 6-2

APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
5. Report by plant personnel of an unanticipated explosion within protected area boundary resulting in visible damage to permanent structure or equipment.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Explosion affecting the Protected Area resulting in visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

The Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04.

Only those explosions of sufficient force to damage permanent structures or equipment within the Protected Area are considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The SS / EC also needs to consider any security aspects of the explosion, if applicable.

NUMARC DEVIATION:

NONE. The grammatical structure of the EAL lends itself to visible damage as reported by site personnel.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-2

1.5.90 6-3

APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
4. Vehicle crash into plant structures or systems within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile that may potentially damage plant structures containing functions and systems required for safe shutdown of the plant. The event is escalated to an ALERT if the crash is confirmed to affect a plant vital area.

NUMARC DEVIATION:

NONE: PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems within the Protected Area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-3

1.5.91 6-4

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU3 Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant.
1. Report or detection of toxic or flammable gases that could enter within the site area boundary in amounts that can affect normal operation of the plant.
2. Report by Local, County, or State Officials for potential evacuation of site personnel based on offsite event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on releases in concentrations within the Site Boundary that will affect the health of plant personnel or affecting the safe operation of the plant with the plant being within the evacuation area of an offsite event *(i.e., tanker truck accident releasing toxic gases, etc.).* In the latter case, the evacuation area will be as determined from the DOT Evacuation Tables for Selected Hazardous Materials, located in the DOT Emergency Response Guide for Hazardous Materials.

NUMARC DEVIATION:

The EAL does not address toxic or flammable gas origins or causes for evacuations of personnel located within the Site Area Boundary due to an offsite event. Gases that could enter the Site Boundary encompass causes for evacuation. The EAL addresses the impact to personnel and the safe operation of the plant, regardless of the origin of these evacuation directives.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.92 6-5

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
6. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals

LOCATION: Table 6: HAZARDS / Row 5

TECHNICAL BASIS:

This EAL is intended to address main turbine rotating component failure of sufficient magnitude to cause observable damage to the turbine casing or to the seals of the turbine generator. Of major concern is the potential for leakage of combustible fluids *(lubricating oils)* and gases *(hydrogen cooling)* to the plant environs. Actual fires and flammable gas build-up are appropriately classified via HU2 and HU3. This EAL is consistent with the definition of an NUE while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment.

NUMARC DEVIATION:

"Turbine oil seals" is indicated to clarify the intent of the EAL. Damage to the turbine casing is determined by visual and/or indicated observations from the Control Room *(i.e., visual CRT display of turbine bearing vibrations and condenser vacuum indicators)*. Sufficient instrumentation exists to adequately determine turbine failures involving seal failures which conform to the intent of this EAL. A reliance is implied, though, for visual damage indications by plant personnel.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-5

1.5.93 6-6

APP MODE: MODES 1 - 6 — *CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
1. (Site-specific) method indicates felt earthquake.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid "Strong Motion Accelerometer System Trigger" indicated on Seismic Warning Panel per 79IS-9SM01

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL references PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, which is performed by the Shift Technical Advisor upon receipt of a "SEISMIC OCCURRENCE" Control Room annunciation. Under the intent of this EAL, damage may be caused to some portions of the site, but should not affect ability of safety functions to operate. The method of detection is based on instrumentation and validated by the aforementioned procedure. As defined in the EPRI-sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, a "felt earthquake" is:

An earthquake of sufficient intensity such that: *(a)* the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and *(b)* for plants with operable seismic instrumentation, the seismic switches of the plant are activated. For most plants with seismic instrumentation, the seismic switches are set at an acceleration of about 0.01g.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-6

1.5.94 6-7

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
2. Report by plant personnel of tornado striking within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Tornado affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the assumption that a tornado striking *(touching down)* within the Protected Area Boundary may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. If such damage is confirmed visually or by other in-plant indications, the event will be escalated to an ALERT.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-7

1.5.95 6-8

APP MODE: **MODES 1 - 6**

CLASS: **NUE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
7. (Site-Specific) Occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-8

1.5.96 6-9

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA2 Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown.
1. The following conditions exist:
a. Fire or explosion in any of the following (site-specific) areas:
w (Site-specific) list
AND
b. Affected system parameter indications show degraded performance or plant personnel report visible damage to permanent structures or equipment within the specified area.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage (e.g.. deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:
Equipment and plant areas required for the current operating Mode are delineated in PVNGS Technical Specifications. As such, a determination can be made if the fire or explosion is potentially affecting one or more redundant trains of safety systems which are required to be OPERABLE for the current operating Mode. With regard to explosions. only those explosions of sufficient force to damage permanent structures or equipment required for safe operation within the identified plant area should be considered. As used here. an explosion is a rapid. violent. unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. The inclusion of a "report of visible damage" should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The declaration of an ALERT and the activation of the TSC will provide the Emergency Operations Director *(EOD)* with the resources needed to perform these damage assessments. The EOD also needs to consider any security aspects of the explosion*(s)*, if applicable.

NUMARC DEVIATION:
Specifying "plant areas and equipment required for the current operating Mode" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of functions and systems applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details functions and systems required to be OPERABLE for applicable Modes.

SOURCE DOCUMENT:
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-9

1.5.97 6-10

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA5 Control Room Evacuation Has Been Initiated.
1. Entry into (site-specific) procedure for control room evacuation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Entry into 4xAO-xZZ27 or 4xAO-xZZ44 for Control Room evacuation

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

With the Control Room evacuated, additional support with monitoring and direction through the Technical Support Center and/or Emergency Operations Facility is necessary. Inability to establish plant control from outside the Control Room will escalate this event to an SAE.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-10

1.5.98 6-11

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
5. Vehicle crash affecting plant vital areas.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact affecting plant vital areas

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile affecting a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems affecting a plant vital area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-11

1.5.99 6-12

APP MODE: MODES 1 - 6	***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
3. Report of any visible structural damage on any of the following plant structures:
w Reactor Building
w Intake Building
w Ultimate Heat Sink
w Refueling Water Storage Tank
w Diesel Generator Building
w Turbine Building
w Condensate Storage Tank
w Control Room
w Other (Site-Specific) Structures

PVNGS EMERGENCY ACTION LEVEL (EAL):

Visible structural damage to any building containing safe shutdown equipment

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL addresses structures containing systems and functions required for safe shutdown of the plant. The structural damage implied has origins related to any destructive phenomena not explicitly addressed in any other EAL in this category.

NUMARC DEVIATION:

Specifying "any building containing safe shutdown equipment" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of plant structures and buildings applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details plant structures and buildings required to be OPERABLE for applicable Modes as delineated within Limiting Conditions for Operation *(LCOs)* requiring Operability for all supporting equipment and functions needed for Operability of the applicable system or function.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007. Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.100 6-13

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA3 Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown.
1. Report or detection of toxic gases within a Facility Structure in concentrations that will be life threatening to plant personnel.
2. Report or detection of flammable gases within a Facility Structure in concentrations that will affect the safe operation of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on gases that have entered a plant structure affecting the safe operation of the plant. The EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or other areas that are not contiguous or immediately adjacent to plant vital areas. It is appropriate that increased monitoring be done to ascertain whether consequential damage has occurred. The PVNGS site Fire Department operates under OSHA guidelines in determining if facility structures meet habitability requirements. They are staffed continuously and are trained and required to respond to hazardous materials, hazardous atmospheres, etc.

NUMARC DEVIATION:

This EAL has been phrased to allow for the inclusion of safe plant operations encompassing both plant personnel and safety systems required for the current operating Mode. Equipment required for the establishment and maintenance of Cold Shutdown is required to be OPERABLE in Modes specifying the applicability.

SOURCE DOCUMENT:

PVNGS Procedure 14AC-0FP02, Emergency Notification and Response, Rev. 02.02
PVNGS Procedure 14DP-0FP27, PVNGS Fire Department Hazardous Incident Response, Rev. 00.00
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-13

1.5.101 6-14

APP MODE: MODES 1 - 6	***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
6. Turbine failure generated missiles result in any visible structural damage to or penetration of any of the following plant areas: (site-specific) list.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL is intended to address the threat to safety related equipment imposed by missiles generated by main turbine rotating component failures. Since PVNGS was designed to minimize impacts to safety related equipment caused by main turbine rotating component failures *(i.e., no safety related equipment is located on a tangent to turbine rotational direction)*, there are no areas within which damage to structures containing this equipment can be affected by ejected turbine components. Catastrophic failure of the main turbine rotating components, though, would likely cause damage to the main condenser, condensate and/or circulating water system*(s)* piping, or personnel in the vicinity. However, this EAL is consistent with the definition of an ALERT in that if missiles have damaged or penetrated areas containing safety related equipment, the potential exists for substantial degradation of the level of safety of the plant.

NUMARC DEVIATION:

No listing of structures containing safety related equipment specific to PVNGS is included in the EAL due to the inherent characteristics of the manufacturers' design of the plant *(i.e., Bechtel, Combustion Engineering)*. No safety related equipment is located on a tangent to the rotational direction of the main turbine spindles.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.102 6-15

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
1. (Site-Specific) method indicates Seismic Event greater than Operating Basis Earthquake (OBE).

PVNGS EMERGENCY ACTION LEVEL (EAL):

Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Seismic events of this magnitude can cause damage to safety functions. The determination of the magnitude of the seismic event is based on preliminary analysis by the Shift Technical Advisor that the OBE annunciation is valid. The event classification can then be declared in a prompt manner. Performance of 79IS-9SM01, Analysis of Seismic Event, by the STA upon receipt of "SEISMIC OCCURRENCE" Control Room annunciation is then performed as appropriate to the indications.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
PVNGS Updated Final Safety Analysis Report (UFSAR), Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.103 6-16

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
2. Tornado or high winds striking plant vital areas: Tornado or high winds greater than (site-specific) mph strike within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Wind loads of this magnitude can cause damage to safety functions. Sustained winds of > 105 mph or tornados with cyclonic velocities exceeding 260 mph *(Category F5)* with simultaneous tangential movement of 40 mph *(i.e., 260 + 40 = 300 mph)* are design levels per the PVNGS FSAR. Sustained winds are wind speeds averaged over one minute that generally remain continuous for at least 15 minutes *(NOAA-NWS definition)* and exclude localized gusts exceeding these wind velocity limits.

NUMARC DEVIATION:

NONE. "Sustained" winds are based on National Weather Service *(NWS)* forecasts and/or warnings issued locally. Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, meteorological tower data should not be used for weather assessments regarding wind velocities of this force for emergency classification purposes. Estimated sustained winds furnished by the National Weather Service should provide the basis for emergency classification purposes. EAL HA1-3 will provide evidence of damage to safe shutdown structures when winds of this nature are exceeded.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

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1.5.104 6-17

APP MODE: MODES 1 - 6 | *CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
7. (Site-Specific) occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding potentially affecting safety systems required for the current operating Mode

LOCATION: Table 6: HAZARDS / Row 9

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation. The effect that flooding of this extent could have on "safety systems required for the current operating Mode" is consistent with other hazards and naturally occurring events of this type.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-17

1.5.105 6-18

APP MODE: MODES 1 - 6 ***CLASS:*** SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS2 Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established.
1. The following conditions exist:
a. Control room evacuation has been initiated.
AND
b. Control of the plant cannot be established per (site-specific) procedure within (site-specific) minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

Expeditious transfer of safety systems has not occurred but fission product barrier damage may not yet be indicated. PVNGS Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix R Operational Considerations, establishes 23 minutes for initiating Auxiliary Feedwater to the steam generator*(s)* as the most limiting initial action which must be taken under these conditions. However, the 15 minute time period established generically for transfer of safety system control to the Remote Shutdown Panel*(s)* is based on an assessment as to how quickly control must be re-established without core uncovering and/or core damage possibly taking place. *(Based on the generic basis, this time period must never exceed 15 minutes.)* In Cold Shutdown and Refueling Modes, operator concern is directed toward maintaining core cooling such as is discussed in Generic Letter 88-17, Loss of Decay Heat Removal. In power operation, Hot Standby, and Hot Shutdown Modes, operator concern is primarily directed toward maintaining critical safety functions and thereby assuring fission product barrier integrity.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50 Appendix R Operational Considerations, 29 JUL 93
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside the Control Room; Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-18

1.5.106 7-1

APP MODE: MODES 1 - 6 — ***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU4 Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant.
1. Bomb device discovered within plant protected Area and outside the plant Vital Area.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

This EAL is based on the PVNGS Site Security Plan. Security events which do not represent at least a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 or, in some cases, under 10 CFR 50.72. The plant Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04. A bomb discovered in the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Color Code Condition - Red *(Security Emergency).*

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-1

1.5.107 7-2

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA4 Security Event in a Plant Protected Area.
1. Intrusion into plant protected area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within the Protected Area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

The Control Room Shift Supervisor should declare this EAL when there is direct evidence that hostile forces are or have been inside the Protected Area, but the Control Room or any vital area are not currently threatened. The Shift Supervisor should also consider this EAL in situations where the presence of hostile forces within the Protected Area is indicated by sabotage to plant equipment, but the full extent of damage to equipment or the full scope of the sabotage may not yet be known. This class of security events represents an escalated threat to plant safety above that contained in the NUE. For the purposes of this EAL, a civil disturbance which penetrates the Protected Area Boundary can be considered a hostile force and, as such, the intrusion of this hostile force into the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-2

1.5.108 7-3

APP MODE: MODES 1 - 6 ***CLASS:*** SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS1 Security Event in a Plant Vital Area.
1. Intrusion into plant vital area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within any vital area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Hostile forces consist of one or more persons armed with any sort of weapon*(s)* whose intent is evident by declaration or action to cause damage to plant equipment or injury to plant personnel. The principal role in dealing with a security threat belongs to the security forces. The role of the operator is to ensure to the maximum extent possible under the circumstances that the health and safety of the public is protected. Entry of hostile forces inside the protected area compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. Hostile forces may seek to damage plant equipment and cause a release, or injure or kill plant operating staff. Situations where hostile forces are known to have entered the Protected Area places the Control Room, Remote Shutdown Panels, or other areas defined as vital in the unit security plans at extreme and immediate risk. Entry of hostile forces inside the protected area undoubtedly constitutes a situation in which there is an actual or potential substantial degradation in the level of plant safety. This class of security events represents an escalated threat to plant safety above that contained in the ALERT in that a hostile force has progressed from within the Protected Area to a vital area.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-3

1.5.109 7-4

APP MODE: **MODES 1 - 6** ***CLASS:*** **GE**

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HG1 Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown.
1. Loss of physical control of the control room due to security event.
2. Loss of physical control of the remote shutdown capability due to security event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Entry of hostile forces into the Control Room or Remote Shutdown Panel Room*(s)* compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. If the hostile forces are known to have entered the Control Room or Remote Shutdown Panel Room*(s)* or other vital plant areas, the freedom of operators to maintain the plant in a safe operating condition is lost. This EAL encompasses conditions under which a hostile force has taken physical control of the Control Room, Remote Shutdown Panel Room*(s)*, or any other vital area required to reach and maintain safe shutdown conditions. Although actual core melt or loss of containment integrity has not occurred and there is no immediate evidence of substantial releases in progress, control of the reactor plant by hostile forces undoubtedly constitutes the most serious possible threat.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-4

1.5.110 8-1

APP MODE: **MODES 1 - 6** | ***CLASS:*** **NUE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
3. Assessment by the control room that an event has occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting the Protected Area

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(i.e., an earthquake is felt but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-1

1.5.111 8-2

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU5 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event.
1. Other indications exist which in the judgment of the Emergency Director indicate a potential degradation of the level of safety of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate a potential degradation of the level of safety of the plant

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the NUE emergency class.

From a broad perspective, one area that may warrant SS/EC judgment is related to likely or actual breakdown of PVNGS event mitigating actions. Examples to consider include inadequate emergency response procedures *(e.g., Emergency Plan Implementing Procedures, etc.)*, transient response either unexpected or not understood, failure or unavailability of emergency systems during an accident in excess of that assumed in accident analyses, or insufficient availability of equipment and/or support personnel.

Specific examples of actual events that may require SS/EC judgment for an NUE declaration are listed below for consideration. However, this list is by no means all inclusive and is not intended to limit the discretion of the SS/EC judgment in applying further examples.

w Aircraft crash on site
w Train derailment on site
w Near-site explosion which may adversely affect normal site activities
w Near-site release of toxic or flammable gas which may adversely affect normal site activities
w Uncontrolled RCS cooldown due to secondary side depressurization

It is also intended that the SS/EC judgment not be limited by any list of events as defined here or as augmented by the site. This list is provided solely as examples for consideration and it is recognized that actual events may not always follow a pre-conceived description.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-2

1.5.112 8-3

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
4. (Site-Specific) indications in the control room.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting plant vital areas

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(e.g., an earthquake is believed to exceed OBE levels but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-3

1.5.113 8-4

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA6 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert.
1. Other indications exist which in the judgment of the Emergency Director indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the ALERT emergency class. If the SS/EC believes that increased monitoring of plant functions is warranted and deems that activation and staffing of Emergency Response Facilities is required for this monitoring, then the ALERT declaration is warranted.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-4

1.5.114 8-5

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS3 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate actual or likely major failures of plant functions needed for protection of the public.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate actual or likely major failure of plant functions needed for protection of the public

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the emergency class description for SAE.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-5

1.5.115 8-6

APP MODE: **MODES 1 - 6** | ***CLASS:*** **GE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HG2 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate: *(1)* actual or imminent substantial core degradation with potential for loss of containment, or *(2)* potential for uncontrolled radionuclide releases. These releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the site boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate:

(1) actual or imminent substantial core degradation with potential for loss of CTMT, or
(2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary.

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the GE class.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-6

Appendix R - Dose Projection Technical Bases

1.0 DOSE PROJECTION TECHNICAL BASES

1.1 Introduction

1.1.1 This document provides various supporting information related to dose assessment activities above and beyond that available in the instructions for Dose Projection, Protective Actions, and the Emergency Exposure/KI. It is intended to be used primarily by the EOF Staff.

1.1.2 This section contains the following subsections:

1.1.2.1 Aids to project dose in an un-monitored release situation. Typical situations where this information may be useful would be a fire (outdoors or in a building) where the release is directly to atmosphere (un-filtered). Other situations might involve a release from the Fuel Building or Auxiliary Building due to an open door or breach; or an outdoor large storage tank being vented directly to atmosphere.

1.1.2.2 The modeled accidents in Mesorem Jr. utilize "standard" and default data in order to expedite the release projection. This section provides information to fine tune a projection by adjustment of various entries. Also provided is detailed accident specific information which may be requested by ARRA or the NRC.

1.1.2.3 Mesorem Jr. can be used to provide additional information beyond the initial dose projections; such as using a completed grab sample analysis to verify a projection, or assigning an important offsite location an individual receptor point. This section covers some selected options in those areas.

1.1.2.4 Source Term Monitoring general information and job aids are provided.

1.1.2.5 Control of dose must be done on a TEDE basis rather than relying on Whole Body dose. Until completed airborne sample data is available, the CEDE component of the TEDE will be unknown. This section provides information on how to use the External EDE and TEDE projected doses from the Mesorem Jr. printout to determine the expected ratio.

1.1.2.6 A methodology to adjust a Mesorem Jr. projection to actual field readings is provided.

1.1.2.7 General RMS information is provided.

1.2 Isolated Containment supporting information

1.2.1 The accident assumption is that a LOCA is occurring inside an isolated containment; with the release being the summed leakage to atmosphere from all of the containment penetrations (even though the penetrations are for the most part in the Aux. Bldg.). This selection may be used for any accident causing airborne activity in an Isolated Containment. The release calculation is based on a correlation of airborne activity to the higher of the RU-148/149 readings.

1.2.1.1 Mesorem requires Rem/hr values for RU-148/149; DO NOT INPUT mRem/hr.

1.2.1.2 Note that a failed fuel situation may cause elevated readings on these monitors even though there is no airborne activity in containment to be released.

1.2.1.3 As the typical leakage is small, extreme monitor levels are needed to result in a significant release.

1.2.2 RU-148/149 correlation reading

1.2.2.1 If RU-148/149 are Inoperable, (or suspect) a calculation has been performed and a chart made (Page 5 this section) such that readings from any of several RU monitors outside containment may be used to correlate to a RU-149 level. Closed Window dose rates taken at the alternate detector geometry may be substituted if available.

1.2.3 Containment Leak Rate

1.2.3.1 The default leakage is assumed to be 852 cc/sec per FSAR Section 6.2.1, Table 6.2.1-3, "Principal Containment Design Parameters"; the containment design level leak rate is 0.1% of the free volume per day at 60 PSIG with a containment free volume of 2.6E6 Cubic Feet (7.36E10 Cubic Centimeters).

1.2.3.2 Increasing Leak Rates per time

0.1	% per day	8.52 E2 cc/sec	(Default)
1.0	% per day	8.52 E3 cc/sec	
0.1	% per hour	2.04 E4 cc/sec	
10	% per day	8.52 E4 cc/sec	
1.0	% per hour	2.04 E5 cc/sec	
100	% per day	8.52 E5 cc/sec	
10	% per hour	2.04 E6 cc/sec	
100	% per hour	2.04 E7 cc/sec	

1.2.3.3 Actual Leak Rates will be difficult for the Technical Staff to determine during an event; ask for bounding estimates within the above alternates.

1.2.4 Basis of mix used for MESOREM projection

1.2.4.1 Reg Guide 1.4, "Assumptions used for evaluating the potential radiological consequences of a loss of coolant accident for pressurized water reactors" calls for the following assumptions to be made by license applicants:

- 25% of the Iodine inventory should be assumed to be available for leakage.
- 100% of the Noble Gas inventory should be assumed to be available - a reduction of the amount of material available for leakage may be taken for containment spray effects, but the amount of reduction should be evaluated on an individual case basis (there is no built-in Mesorem adjustment for this).
- FSAR 6.5.2.2 states that only 6% of the containment volume is unsprayed.

1.2.4.2 For the first 24 hours of an accident, the containment leak rate should assume Technical Specification leak rate at peak accident pressure.

1.2.5 ARRA/NRC - Both groups have procedural requirements which require more data. To be prepared to answer questions the below may be reviewed.

1.2.5.1 Is 20% or greater Core Damage projected or in progress?

- The Mesorem projection will provide an estimated Core Damage Fraction (CDF) in percent. This will not equate readily with the NRC Categories of Fuel Failure, but will provide an indication of the amount of core damage. Provide Tech Staff with the CDF given by Mesorem, and have them determine estimated damage.

1.2.5.2 Will the inventory in Containment exceed the PAGs if released at a 100% per day leak rate?

- The projection dose rate and dose values based on an 852 cc/sec leak rate are multiplied by 1000 to obtain 100% release per day values; and by 24,000 to obtain 100% release per hour values.

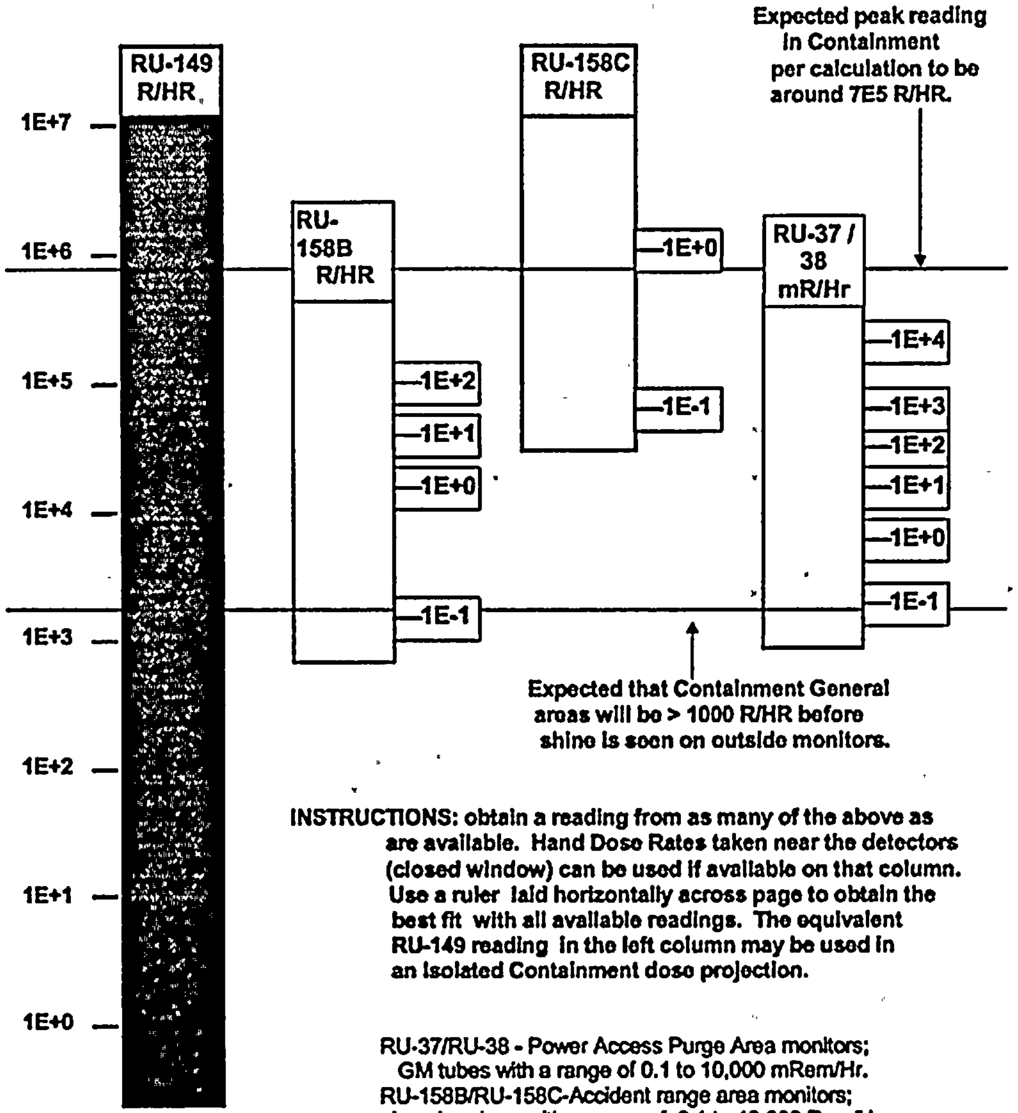
1.2.5.3 What is the expected dose at Site Boundary if the leak rate increases by a factor of 10 or 100?

- If RU-148 has the same reading when the leak rate increases by a factor of ten, the projected Site Boundary dose will also increase by a factor of 10.

1.2.6 The following table provides a visual idea of the RU-148 levels required to obtain similar Site Boundary Dose rates as leak rates vary. The calculations reflect the RU-148 readings that would meet the EAL 3-16 and 3-19 levels. These are worst case scenario calculations done with default met data, shortest distance to Site Boundary, etc.

Leak Rate from Containment	RU-148 in Rem/hr	EAL 3-16 Criteria met @Site Boundary	EAL 3-19 Criteria met @Site Boundary
100%/Day	80	100 mRem/hr TEDE	
(8.52E5 cc/sec)	500		1 Rem/hr TEDE
10%/Day	500	100 mRem/hr TEDE	
(8.52E4 cc/sec)	2800		1 Rem/hr TEDE
1%/Day	2800	100 mRem/hr TEDE	
(8.52E3 cc/sec)	13,300		5 Rem/hr Thyroid CDE
.1%/Day	13,300	500 mRem/hr Thyroid CDE	
(8.52E2 cc/sec)	36,500		5 Rem/hr Thyroid CDE

1.2.7 CONTAINMENT DOSE RATE ESTIMATION USING AREA MONITORS EXTERNAL TO CONTAINMENT



INSTRUCTIONS: obtain a reading from as many of the above as are available. Hand Dose Rates taken near the detectors (closed window) can be used if available on that column. Use a ruler laid horizontally across page to obtain the best fit with all available readings. The equivalent RU-149 reading in the left column may be used in an isolated Containment dose projection.

RU-37/RU-38 - Power Access Purge Area monitors; GM tubes with a range of 0.1 to 10,000 mRem/Hr.
RU-158B/RU-158C-Accident range area monitors; Ion-chambers with a range of 0.1 to 10,000 Rem/Hr.

1.3 Steam Generator Tube Rupture supporting information

1.3.1 Steam Generator Tube Rupture

1.3.1.1 The release path may be steam released directly via the Main Steam Safety Valves (MSSVs); the Atmospheric Dump Valves (ADVs) or the Steam Bypass Control System valves (SBCS numbered 1007 and 1008).

1.3.1.2 The release path may be through the Plant Vent Stack from the condenser air removal line (and through the Condenser Air Removal filter if lined up).

1.3.1.3 The release will most likely be a combination of the above, with a very complex situation of valves opening varying percentages for varying periods. The initial projections will be very conservative, and the EOF Staff should make it a priority to break down the release into more accurate separate calculations. It is essential that the Operations/Technical Staff assist in this effort.

1.3.1.4 A possibility exists that a Steam Generator could fill completely during an accident (go solid). If a generator would fill with primary side water such that fresh primary is being dumped to the atmosphere all projected Thyroid CDE data should be multiplied by 100.

1.3.2 Early indicators

1.3.2.1 An early indication of a primary/secondary leak at power will be given by the RU-142 monitors, Channels 1 through 4. They will indicate roughly 40 cpm to 300 cpm as conditions change from normal (no leaks) to about 30 GPD. This reading is quantitative only, as where the leak physically occurs in the Steam Generator will have a significant effect on the N-16 carryover activity. Therefore the primary use of these monitors will be in the initial leak phase, prior to reactor shutdown. Increases seen on these channels will be one of the first indications that a leak is occurring, and will serve to verify any RU-4/5/139/140/141 increases seen. In a significant leak (>30 GPD) these monitors can be expected to go way upscale, perhaps even saturate; and the shine from the affected generator line will probably result in indications on all three adjacent detectors.

1.3.3 Other RMS

1.3.3.1 Applicable monitors are RU-141; RU-143/144; RU-139/140; RU-4/5.

1.3.3.2 RU-141 monitors activity from the Condenser Air Removal System (CARS); with the Alert Alarm will indicating an activity increase of 4X > normal; the High Alarm will line up the CARS filter and equates to a 1 GPM Tube Leak assuming 1% Failed Fuel. The CARS line inputs into the Plant Vent Stack, upstream of the RU-143/144 Stack monitors.

1.3.3.3 An RU-143/144 alarm may be a result of more than one input (see map on DPTB Page 11).

1.3.3.4 RU-139 A&B and RU-140 A&B are the main steam line monitors located upstream of all Safety's/Dumps/ADVs. They will over-respond initially to N-16 carryover in the steam if the reactor is still critical during a tube rupture phase. They will have a period when release activity is being carried over by the steam but is not seen as it is less than the 1.5 mRem/hr keep-alive source value.

1.3.4 Worst case defaults

1.3.4.1 Should RU-139/140 be inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release These default values are based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, and assume 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release

1.3.5 DOs and DON'Ts

1.3.5.1 Verify with OPS that the CAR Filter is lined up.

- The default value of 95% should be used for iodine removal efficiency unless the Condenser Air Removal filter is unavailable or indications of impaired efficiency exist. Indications would be alarms from the filter bank temperature and pressure sensors in the Control Room. Temperatures of > 265° F indicate impaired filtration; > 625° F indicates a fire in the carbon filter banks; high differential pressure indicates filter loading. Adjustments to the 95% values should be approved by the RPM/RAC based on the STA/TSC Staff information.

1.3.5.2 Adjusting defaults for over conservatism.

- The default value for RCS Hot Leg (210°) reflects the lowest possible vapor value and is not meant to be a reasonable value to use.
- The default steam flows will most likely never be appropriate to use for a 2 hour release scenario. The maximum steam flows possible (100% power) are in the table below - these should be adjusted per the STA and Tech Staff estimates - DO NOT BE RELUCTANT TO MAKE COMMON SENSE ADJUSTMENTS and then DOCUMENT your thought process.

Component @ 100% Power	Maximum Flow in Lbm/Hr
Output of both Steam Generators	1.72E7
Output of one Steam Generator	8.59E6
Fully Open Safety Valve	9.70E5
Fully Open Steam Bypass Control Valve	9.03E5
Fully Open ADV	1.90E6

- The Steam Generators cannot maintain maximum steam flow for anywhere near two hours after reactor trip. The ADVs/Safety's/Steam Bypass Control valves are typically only partially open for short duration periods.

1.3.5.3 Be aware that releases occur below the RU-139/140 threshold level.

- Only activity greater than the 1.5 mRem/hr threshold level of the RU-139/140 inline monitors will be seen via RMS. If it is likely that activity is being released at these lesser levels, a bounding calculation can be done by using the current Meteorological data and running a projection using 1.5 mRem/hr.

1.4 LOCA Supporting Information

1.4.1 This accident scenario models an RCS leak outside of containment;

1.4.2 The "Plant Vent Exhaust Contributors" and "Fuel Building Exhaust Contributors" should be reviewed to ensure the correct release path(s) are being used.

1.4.2.1 Note that a SIAS will route any activity from the lower level Auxiliary Building Ventilation (below 100') through the Fuel Building Essential Filters. This activity will be released via the Fuel Building Stack and monitored by RU-145/146, with the above 100' levels of the Auxiliary Building being released via the Plant Vent Stack and monitored by RU-143/144.

1.4.3 Fuel Building Vent Stack: leakage activity is released through the Fuel Building Vent Stack and monitored by RU-145/146 or FB PASP.

1.4.3.1 An accident involving elevated Fuel Building activity due to a Spent Fuel bundle leak should be modeled under "Fuel Handling Accident" which utilizes a different source term mix is used.

1.4.4 Plant Vent Stack: Leakage activity is released through the Plant Vent Stack and monitored by RU-143/144 or the PV PASP;

1.4.4.1 An accident involving elevated CARS (Condenser Air Removal System) activity should be modeled under "Steam Generator.Tube Rupture 1%" or Steam Generator Tube Rupture 100%" which utilizes a different source term mix.

1.4.4.2 Typical sources from Auxiliary Building Equipment include Letdown System leaks, Sample System leaks, Gas Stripper leaks, etc.

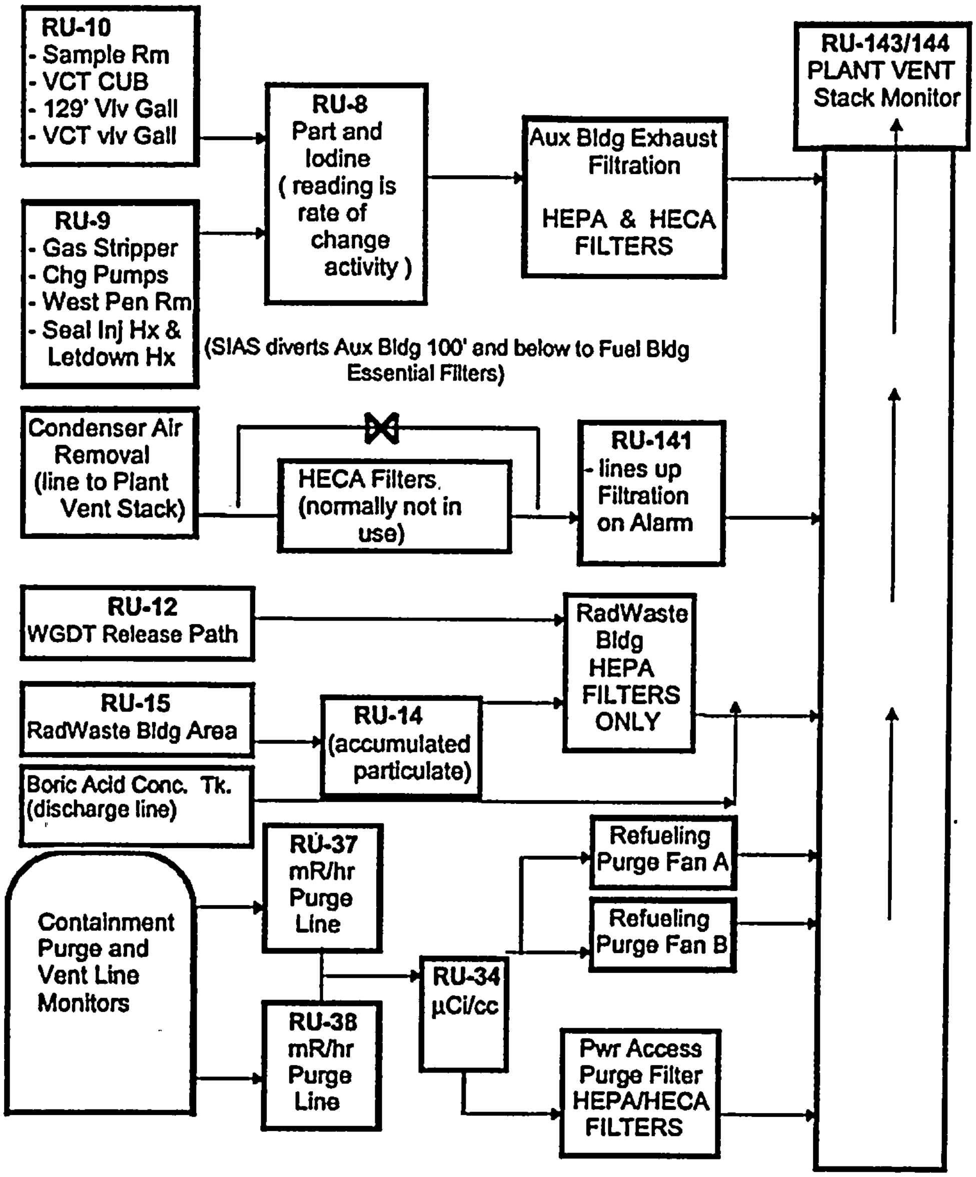
1.4.4.3 The RadWaste Building ventilation exhaust is routed to the Plant Vent Stack. Contributions from the RadWaste Building include the building ventilation, waste gas decay tank discharges and boric acid concentrator discharges. There is no iodine filtration on this release path.

1.4.4.4 An accident involving a Surge Tank or any WGDT which has been isolated for less than 45 days should be modeled as a LOCA 1% to project iodine activity.

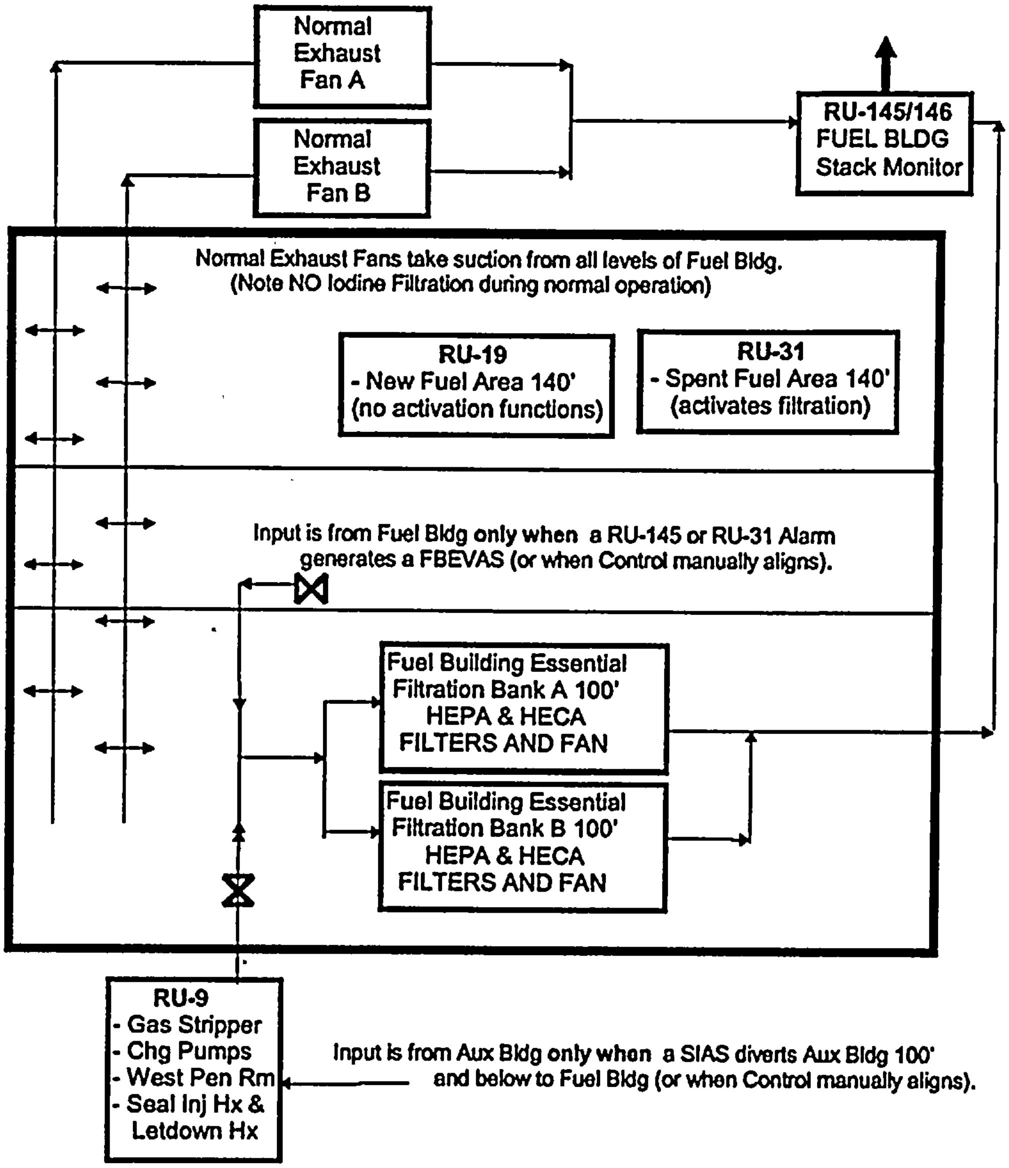
1.4.4.5 A third major source is from the Containment Purge System: a Containment Refueling Purge (non-filtered), a Power Access Purge (filtered) or a Non-Standard Containment Purge (filtered) all release via the Plant Vent Stack.

1.4.4.6 Use of the LOCA 100% accident assumes that an RCS leak has occurred with > 10% cladding failure resulting in significant iodine levels.

1.4.5 Plant Vent Exhaust Contributors



1.4.6 Fuel Building Exhaust Contributors



1.4.7 Basis for Default Ventilation Flow Data

For the Plant Vent	**Stack Flow**	**Default Assumptions**
If fan or pump is running	Maximum rated flow	For Plant Vent:
HAN-J01A (Aux Bldg Normal)	30,000 cfm	
HAN-J01B " " "	30,000 cfm	If Refueling Purge is not operating, 1.13E5 CFM would be the Maximum Default.
	60,000 cfm total	
HRN-J01A (RadWaste Bldg. Normal)	25,500 cfm	1.46E5 CFM with Refueling Purge Operating.
HRN-J01B " " "	25,500 cfm	
	51,000 cfm total	
CPN-J01A (Cnmt.Refueling Purge)	16,500 cfm	
CPN-J01B " " "	16,500 cfm	
CPN-J02 (Cnmt. Power Access Purge)	2,200 cfm	
	35,200 cfm	NOTE:
Condenser Air Removal Pump A	60 cfm	The above defaults include 1540 cfm from the Condenser; while the 2200 cfm from the Cnmt. Power Access Purge is not included.
" " " " B	60 cfm	
" " " " C	60 cfm	
" " " " D	60 cfm	
Gland Steam Exhaust Blower	1300 cfm	
	1540 cfm total	
For Fuel Building Vent	**Stack Flow**	For Fuel Building
If fan is running	Maximum Rated Flow	
HFN-J01A (Normal)	21,750 cfm	43,500 CFM if Normal Fans are operating.
HFN-J01B "	21,750 cfm	
	43,500 cfm total	
HFA-J01 (Essential)	6000 cfm	12,000 CFM if Essential Fans are operating.
HFB-J02 "	6000 cfm	
	12,000 cfm total	

1.5 Fuel Handling Accident Supporting Information

1.5.1 The accident assumption is that a Fuel Handling accident has occurred releasing activity from a fuel bundle. A Fuel Handling accident is considered to be primarily a noble gas cloud and the mix used by Mesorem reflects this. The immediate concern would center primarily onsite.

1.5.2 The mix assumes that virtually all the released activity will be decayed down to primarily Xe-133 and Kr-85, and that all Iodine will be decayed to Iodine 131.

1.5.3 Fuel Building

1.5.3.1 The release is postulated to pass through the Fuel Building Essential Filters enroute to the Fuel Building Vent Stack, where it will be monitored by RU-145/146 or the FB PASP (a FBEVAS or manual operation of Essential Filters is required for iodine filtration; iodine filtration lineups and flowrates should always be verified with Operations).

1.5.4 Containment Building

1.5.4.1 Fuel Handling accident; the release is postulated to pass through the 42" Refueling Purge lines enroute to the Plant Vent Stack, where it will be monitored by RU-143/144 or the PV PASP (the containment may be isolated and/or the purge stopped in short order in such a case; if so, the "Isolated Containment" should then be used to project dose at Site Boundary).

1.5.5 SCRAM TIME

1.5.5.1 For the "Has Reactor Been Scrammed?" prompt:

- The answer to the prompt should always be "Y" as the fuel bundle will no longer be critical ("Y" tells the program to start decaying the mix).

1.5.5.2 For the elapsed time since scram prompt:

- The number of hours and minutes since the fuel bundle has been critical should be entered. An accurate entry of hour and minutes will not be immediately available; a conservative default time to use for decay would be the time the reactor was shutdown for the most recent refueling outage (maximum allowable number of hours is 999.00 - hours greater than 168 will have an insignificant impact on the calculation).

1.6 Waste Gas Decay Tank

1.6.1 The accident assumption is that the Waste Gas Decay Tank has been isolated from the gas header and Surge Tank. The release would be through the RadWaste Building HEPA filters and monitored by the Plant Vent Stack RU-143/144 or PASP monitor. Per the UFSAR analysis of a rapid release using maximum inventory, the iodine dose would be 3 mRem or less at Site Boundary; therefore no iodines are projected. For a Surge Tank or any online tank or pathway gaseous release which may contain significant iodine activity (has been isolated for < 45 days) use the " LOCA 1%" scenario.

1.6.2 SCRAM TIME

1.6.2.1 For the prompt "Enter number of hours and minutes since the tank has been isolated ":

- The Shift RadWaste Building Operator will provide the time since the tank has been isolated (if the time is not readily available use the default of 999 hours).

1.7 Unmonitored release

1.7.1 General notes

1.7.1.1 Typical accident assumptions would be that a release is occurring which is not monitored by an RMS monitor, nor is there a flow rate available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release would be a ruptured tank in the RadWaste Yard which contained radioactive liquids; an outside fire involving radioactive waste, an accident involving a waste shipment on site, an accident in the Radwaste Storage Building, etc. In all those cases, release rates would typically be relatively low, but the potential does exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a Mesorem projection until actual Site Boundary data is available. The below information may be used to supplement the Dose Projection guidance.

1.7.2 Categorize - Fit the release into one of the below three conditions and follow the direction.

1.7.2.1 Primarily Noble Gas- with neither iodines nor particulates being significant contributors (a ruptured liquid outside storage tank, a fuel handling accident or waste gas tank accident being release through an open roll-up door, breach in wall, etc., a system/tank vent in containment during an outage with outside hatch).

- These can be modeled by using a WGDT (you are fairly certain there is no iodine present) or Fuel Handling accident (if there may be small amounts of iodine being released) selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.2 Noble Gases and Iodines - with particulates not being a significant contributor (a breach in the Aux. Bldg/Fuel Bldg. during LOCA conditions, degassing of a major tank/system volume in containment during an outage with outside hatch open).

- These can be modeled by using a LOCA accident selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.3 Primarily Particulates - with noble gas and iodines not being significant contributors (a fire involving compacted waste, resins, etc.).

- Mesorem will be of limited usefulness in this situation. Follow the direction on the next page to obtain an initial PAR.

1.7.3 Particulate Release - The Mesorem Jr. built-in projections will not model a particulate only release. However, the plume "footprint" as developed by Mesorem from current Met data will be useful, and a projection should first be run for this purpose (using any accident scenario). The Chi/Q values generated in this projection will be used to develop Site Boundary dose estimates, per the following methodology.

1.7.4 Plume footprint - Perform a LOCA 1% Mesorem run using actual meteorological data (all other inputs are unimportant at this point). Obtain the printout.

1.7.5 Release Rate - Determine the best estimate of the number of Curies involved in this release per RadWaste paperwork and/or RadWaste Group. Use this total curie number and estimate how quickly the material is being released.

1.7.5.1 Example: a group of 55 Gal Drums is burning. Reviewing the paperwork with RadWaste indicates a total of 12 Curies are involved. Estimates from Fire Protection at the scene indicate they expect the total fire time to be 60 minutes. Assuming that all 12 Curies will eventually be released, the release rate would be 12 Ci/60 Min or 12 Ci/3600 Seconds or 3.33E-3 Ci/Sec.

1.7.6 Dose Conversion Factor - Per the R/W paperwork select a Dose Conversion Factor (from DCFs below). These represent TEDE dose based on annual waste stream sample analysis.

DCF per Waste Category (Rem-M^3/Ci-hr)	Unit 1	Unit 2	Unit 3
Dry Active Waste (*55 Gal Drums*)	4.08E5	8.26E4	1.08E5
Resin Lo Level	2.76E5	7.35E4	7.91E4
Resin Hi Level	8.05E4	6.02E4	5.62E4
Process Filters	1.76E5	3.29E4	5.02E4
Concentrate	3.75E5	1.07E5	6.90E4
Tri-Nuke Filters	2.10E5	5.98E4	5.68E4
Resin Condensate Demins	5.69E4	5.69E4	5.69E4
Resin Blowdown	1.41E5	6.24E4	6.24E4

1.7.7 Then: __________ Ci/Sec (estimated release rate) X _______________ receptor Sec/M3 = ________ Ci/M3 X ____________ Rem-M3/Ci-hr = _______ Rem/hr in TEDE at the receptor.
where: the Sec/M3 is the Chi/Q at the receptor site (normally Site Boundary but may be used for any receptor point) and taken from the Mesorem printout you directed per current Met. data.

1.7.8 Followup actions

1.7.8.1 Expedite efforts to obtain grab samples and detailed dose rate readings (accurate times samples are taken and specific locations of samples and dose rates will be crucial for later reconstruction of release). For tanks, waste shipments, etc., there may be isotopic analysis of contents available, and these should be obtained for Technical Staff use.

1.7.8.2 Direct actions to isolate event onsite with appropriate radiological postings; have word passed as required for protection of Onsite personnel; provide airborne ingestion and inhalation protection for the responding staff in a conservative manner until field samples are available.

1.7.8.3 Fax isotopic information to ARRA as it becomes available; the RASCAL Dose Assessment Program used by ARRA has some options to input particulates which Mesorem does not.

1.7.8.4 Whole Body Count field teams and other selected available personnel who have been in or near the plume. This information can assist in the recreation of the event (e.g., negative results might show no release occurred).

1.7.8.5 Whole Body Count data can be used to determine the skin dose received by an individual in cases where individuals immersed in a plume may have received high noble gas exposures. Such individuals should be brought in and the dosimetry department directed to perform the appropriate body count and analysis.

1.8 Source Term Monitoring

1.8.1 Need to verify source term

1.8.1.1 "The largest single component of uncertainty is expected in the estimate of the source term"; "Dose projections should be viewed only as rough estimates"; "It is apparent that, overall, the best that can be expected early in an accident release sequence is that projected doses may be within a factor of 10 of the doses based on field monitoring; it is likely that they will be less accurate" - these statements are all from NUREG/CR-5247, RASCAL Version 2.1 User's Guide. Radiological Assessment System for Consequence AnaLysis is the USNRC's Dose Assessment Program, and the cautions apply to us as well as them.

1.8.1.2 Training Drills and Exercises are conducted with data that correlates well. This is a necessity if the training is to be effective, although not realistic. Expect to have to make a correlation adjustment in actual conditions.

1.8.2 Initial actions

1.8.2.1 Direct sampling to allow comparisons of actual samples to the Iodine/Noble gas ratios and mixtures used by Mesorem.

1.8.2.2 Ensure that grab samples are obtained from the onsite release source, whether via the stack monitor sampling rig, or by local samples.

1.8.2.3 Verify filtration is in effect and fuel condition assumptions are correct.

1.8.3 Comparison actions

1.8.3.1 RO2/2A Closed Window readings may be compared to the calculated mRem/hr (external EDE) readings at a specific location.

1.8.3.2 The initial Particulate and Iodine µCi/cc values will be radioed in by the field teams (these readings are converted from cpm/min to a gross µCi/cc value based on I-131 equivalent energy). The Iodine cartridge mCi/cc level may be used as a Rem/hr approximation for comparison with the projected Thyroid CDE value at that same point.

1.8.3.3 A worksheet to accomplish the above comparisons follows on the next page.

1.8.3.4 As soon as possible, a centerline sample should be brought onsite for an isotopic analysis. The total µCi/cc from Noble Gases and Iodines may be used by the RAC Staff to back-calculate the source term or determine the external EDE/TEDE ratio.

1.8.4 Corrective actions

1.8.4.1 If the I/NG ratio and mix in Mesorem are close to the actual composition, adjust the Mesorem projection by repeated runs, varying the RMS value until projected data agrees with the field data.

1.8.4.2 If the I/NG ratio and/or the mix need adjustment, obtain the isotopic analysis of the sample that best fits the current situation. Per Section 4.0, page 18, "Running a Projection Using Grab Sample Data" direction, obtain an updated projection reflecting the actual source term. Note that the RMS value entered may not match the activity calculated per the sample. Mesorem will alert you to that fact by pointing out whether the entered RMS value is high or low, and then asking if you want to continue. Continue to obtain a projection based on that specific mix.

1.8.5 MESOREM receptor comparison worksheet

1.8.5.1 As early as possible, verify that the projection is reasonable by comparing actual field results to projected. This worksheet provides a simple way to convert the projected readings to numbers that can be readily compared to field readings. Results and thought processes are to be entered in the formal log for record keeping purposes.

1.8.5.2 Direct the teams to call in closed window (CW) dose rates (equal to external EDE) and a gross iodine µCi/cc based on the frisker reading taken on a air sample silverzeolite cartridge.

1.8.5.3 Make sure the readings used are CENTERLINE (C/L) and are a reasonable time match (if the sample was taken at Site Boundary, and the plume took ~30 minutes to reach Site boundary, then the Mesorem projection used for comparison purposes should have been done about ~30 minutes ago).

1.8.5.4 Comparison

ACTUAL	PROJECTED
Field Reading @ ______ miles	Projected Reading @ ______ miles
CW ______ mR/hr	External EDE ______ mR/hr
Gross Iodine ______ µCi/cc	Projected Iodine ______ µCi/cc

Where "Projected Iodine" is equal to

______ sec/m3	x ______ µCi/sec	^{3} 1 E6	= ______ µCi/cc
(DCHI/Q) from Page 1 MESOREM printout; additional distances require setting a DYNAMIC Receptor at that field location for the projection.	(Release Rate) from Page 4 MESOREM printout; use the I, not NG, release rate (same release rate applies to all distances).	Conversion constant (µCi/m3 to µCi/cc)	The Projected Iodine per MESOREM; Jr.

1.9 External EDE/TEDE Ratios

1.9.1 Need for ratios

1.9.1.1 An immediate need as Onsite and Offsite Field Teams are dispatched is to provide the teams with TEDE dose limits (EPA guidance and recommendations on dose limits for workers during emergencies is detailed in Appendix K - Emergency Exposures and KI) and a means to remain within those limits using only SID and dose rate meter readings (external EDE values).

1.9.1.2 In addition, in severe accidents the Thyroid CDE dose needs to be monitored for KI administration (if > 25 Rem).

1.9.2 TEDE Dose

1.9.2.1 As calculated by Mesorem and per EPA guidance TEDE is the external EDE dose summed with the CEDE dose. Determine the TEDE Dose limit to be applied for each Field Team (per a review of section Appendix K - Emergency Exposures and KI).

1.9.3 Lo CEDE Dose

1.9.3.1 In releases which are primarily Noble Gas with minimal Iodine levels (low CEDE value) the ratio of external EDE to TEDE will approach "1" and no correction to the SID reading will be required. Determine desired TEDE Limit for each team and direct them to use un-corrected SID Dose to remain within that limit.

1.9.4 Hi CEDE Dose

1.9.4.1 In releases with significant iodine levels, the CEDE will become larger and the ratio of the SID reading (external EDE) to TEDE will become less than one. Per EPA recommendations in such cases, the TEDE dose limit should be ratioed down to provide effective TEDE dose control via control of External EDE. Determine desired TEDE Limit for each team and determine the working SID Dose to remain within that limit per below direction.

1.9.5 EDE/TEDE calculation

1.9.5.1 An initial external EDE/TEDE ratio using the Mesorem projection data can be done, remembering that it is critical that the data is selected for the distance from the Site that the Field Team will be operating. Use the "MAX" distance value (the .25 mile data from page one on the printout) for Onsite Teams. As soon as actual field data becomes available the ratio should be checked and updated.

$$\text{ratio} = \frac{\text{external EDE}}{\text{TEDE}}$$

external EDE (value from page 1 of the Mesorem printout in mR/Hr)

TEDE (value from page 1 of the Mesorem printout in mR/Hr)

other values available via PAR Receptor information

1.9.6 Working Limit

1.9.6.1 Multiply the desired TEDE limit for that person or Team by the ratio above; issue the reduced working limit in mRem.

1.9.7 Thyroid CDE Dose Control

1.9.7.1 Determine an appropriate expected Thyroid dose for each Field Team using the Mesorem page 1 projection data initially (dose rates assume C/L exposure for 1 hour). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.2 If the potential Thyroid dose approaches 25 Rem, consider ways to reduce dose; if necessary issue KI (Potassium Iodide). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.3 As soon as actual field data becomes available the expected dose should be checked and updated.

1.9.8 Thyroid CDE from field readings

1.9.8.1 Frisker readings converted to µCi/cc Iodine equivalent can be used to generate an estimated Thyroid CDE rate in Rem/hr from a field sample. Or, the Gross Iodine activity from a completed analysis on that sample may also be used for estimates.

1.9.8.2 Methodology - Multiply the air sample charcoal frisker reading or the total iodine activity from the isotopic analysis (in µCi/cc) times the appropriate conversion factor (in Rem-cc/hr-µCi). Note that the 100% factors are less than the 1% factors due to mix differences.

Sample taken at ____ miles from Site @ ____ degrees from "0" degrees North

Sample taken @ _______ Time on ___________ Date

_______________ µCi/cc X __________ $\frac{\text{Rem-cc}}{\text{hr-µCi}}$ = __________ Thyroid CDE in Rem/hr

1.9.9 Rem-cc/hr-µCi - When Effective Age falls between 2 listed numbers, use the higher age. Select 1% failed fuel unless plant conditions indicate severe (>10%) fuel cladding failure.

Receptor Effective Age (hrs)	1% Failed Fuel	100% Failed Fuel
0-4	6.0 E 5	3.5 E 5
>4-10	7.0 E 5	5.0 E 5
>10-24	9.0 E 5	7.0 E 5
>24	1.1 E 6	1.0 E 6

1:9.10 Application - Note that this methodology can be used Onsite and Inplant as well as for Offsite teams to estimate initial exposure and provide conservative controls. Detailed individual exposure tracking utilizing normal Site procedure should be initiated as soon as practical.

1.10 Mesorem Jr. Specialized Functions

1.10.1 USE OF "COMMAND MENU" OPTIONS

1.10.1.1 F1 - Update Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Update" allows changing the data similar to redoing a projection, and is usually faster. The projection will then have to be run again; see following instructions on Execute Dispersion Model. Note that redoing the entire projection from the "Execute Dispersion Model" selection will accomplish the same result and may be the simpler approach.

Additional options available are:

1. "F1-Meteorology Data File" allows you to enter precipitation (in/hr) if desired; the precipitation rate is available as a 15 minute rate or as an hourly total on the line printer at the Met Tower. Send an I&C Tech out to obtain the in/hr data.

2. "F5-Receptor Data File" allows you to review the entire list of receptors; or to add, update/display or delete existing receptors. This option is useful to match field data more exactly to a projection; and to calculate a PAR for a specific point not on the receptor list.

1.10.1.2 F2 - Execute Dispersion Model: offers two choices, "F1 - Fast Mode A and update from sequential screens" or "F2 - Mode A and execute model from edited files". "F1" is the normal mode. Use "F2" to run a projection after the files have been edited using the above "Update" selection.

1.10.1.3 F3 - Mode Selection [A or B]: Mode A is always used in the Units and to provide PARS in the EOF; Mode B can be used with the assistance of the Eplan Coordinators if desired.

1.10.1.4 F4 - Display Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Display" allows reviewing the data without the risk of inadvertently changing it.

1.10.1.5 F5 - Back-calculate Source Term: selecting this allows two options "Press A to select the external EDE/TEDE ratio" or "Press B to select Back-calculation of source term". See page 25 for specific direction on these options.

1.10.1.6 F6 - Graphic Display: This selection graphically depicts the plume over a map of the 10 mile EPZ. Selecting this option will allow graphing four different overlays: F1 - External EDE Rate (Immersion) F2 - Adult Thyroid CDE Rate (Inhalation), F3 - Iodine Deposition and F4 - CHI/Q Values.

- The legend supplied with the graph provides the data for the three segments the plume is divided into. The inner segment is provided with one value indicating the peak activity; the next two segments have two values indicating the inner and the outer edge values for that segment; and the "blue" values provided indicate the rates outside the plume and up to it.
- An "ETA" value (Estimated Time of Arrival) gives the time it will take for the plume to reach the 10 mile boundary using the projection wind speed and the assumption that the release has just begun.
- Use the "F2 - Plot" choice to obtain a printout; Use the "F1 - Menu" to exit to the menu. As the wind conditions change a series of graphs should be run and kept as ongoing records of areas potentially contaminated. This will aid the recovery phase.

1.10.1.7 F7 - Password Utility: Used by Emergency Planning Group to set password.

1.10.2 USE OF "RECEPTOR DISPLAY MENU" OPTIONS

1.10.2.1 F1 - External EDE Rate (Immersion): gives the external EDE from plume shine (does not include 4 day deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.2 F2 - Adult Thyroid CDE Rate (Inhalation): gives the Thyroid CDE Rate for all receptors within the designated sectors (normally three).

1.10.2:3 F3 - TEDE Rate (Inhalation): gives the TEDE based on inhalation only (no deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.4 F4 - Protective Action Recommendations and Guides: starts with Site Boundary PAR data as listed on page 2 of the Mesorem printout; then provides PAR Data for all receptors (a review of the following complete receptor list to determine receptors of interest should be done prior to using this option as it is time consuming to scroll through the screens and you cannot scroll back).

- Each receptor will be given Shelter and Evacuation TEDE and TODE dose. The TEDE Dose includes the Inhalation and the 4 Day Deposition Dose for both the Shelter and Evacuation PARS. The Evacuation Dose will therefore be conservative. The minimum or "no dose" value provided will be shown as "< .02" and recommendations will be made as appropriate, including KI Administration.
- The Plume Arrival time in hours is given for each receptor. The time given assumes the release
- May be added as necessary per the "Update Data" option (guidance is on page 2 of this Appendix).

1.10.2.5 F5 - Iodine Deposition Rate: Provides the iodine deposition rate in µCi/m3-sec for all receptors within the designated sectors (normally three). This information will be useful to ARRA and dairy farms in high deposition areas are of particular interest.

1.10.2.6 F6 - CHI/Q Values: Provides the CHI/Q (sec/m3) value for all receptors within the designated sectors (normally three).

1.10.2.7 F7 - Receptor Locations: Provides the same information as the following complete receptor list.

1.10.2.8 Q - Leave Receptor Display Menu: READ THIS PROMPT CAREFULLY!! Selecting "Q" from the Receptor Display Menu will provide the prompt "Do you wish to perform another forecast [Y/N]" ONLY ANSWER "Y" when you are ready to delete the current projection data and start a new projection (begin again). IF YOU WANT TO CONTINUE WORKING WITH THE CURRENT PROJECTION DATA, REVIEW RECEPTOR DATA, PRINT GRAPHS, ETC. enter "N".

1.10.3 PARs for all receptor locations

1.10.3.1 Shelter Dose values and Evacuation Dose values for TEDE and TODE are calculated for about 175 receptor locations beyond the Site Boundary. Although Mesorem automatically reports only the Site Boundary PAR and associated Data on the screen or printout, the additional receptor data can easily be obtained.

1.10.3.2 The complete list of receptor locations is included in this section (they may also be reviewed by selecting "Receptor Locations" on the Receptor Display menu).

1.10.3.3 The Shelter Dose and Evacuation Dose TEDE and TODE values, the Plume Arrival Time, along with the Protective Action Recommendations (including stable iodine administration), may be obtained for any of these receptors by selecting "Protective Action Recommendations and Guides" on the Receptor Display menu.

1.10.4 Receptor display

1.10.4.1 The Receptor Display menu is obtained 3 ways:

1. It appears following the output of a single projection, once one answers "No" to the question "Will this be a simultaneous release?"

2. It appears following the output of a simultaneous projection, once one answers "No" to the question "Do you want to consider other release points?"

3. If back at the Command Menu, select "Display Data", then select "Receptor Data File" on the File Menu.

1.10.4.2 Scrolling - Note that Mesorem Jr. will scroll in order through all the receptor sites starting at Sector "A" and that you cannot scroll back! If you miss the ones you need you will have to start over. Review the following list to be aware of when points will be coming up.

1.10.5 Additional receptors

1.10.5.1 Should none of the existing receptor locations serve the need, one of the "dynamic" receptors (having designation "DY01 thru DY24") may be used for the needed location:

- Select "F1 - Update Data" on the Command menu; then
- Select "F5 - Receptor Data File" on the File menu; then
- Select "F2 - Update/Display a Receptor" on the Receptor Utilities menu
- Use one of the "DY" numbers and enter the required data (note that the "angle" called for is a compass heading from PVNGS to the receptor location desired; where Sector "A" centerline is 0°, and Sector "E" centerline is 90°, etc):
- Once this is done, Mesorem Jr. will calculate doses for the new receptor location.

1.10.5.2 Note that the "Dyxx" Receptor Data will always appear at the end of the receptor display list rather than be placed in the appropriate sector with the permanent individual receptors.

1.10.5.3 List of Receptors

RECEPTOR NAME	DIRECTION	ANGLE (deg)	DISTANCE (mi)	COMMENTS
Site Boundary "A"	N	000.0	00.60	SB, 2, 5, 10,15,20,30,40,50 distances
SC02	N	000.0	07.00	Ruth Fischer School
Site Boundary "B"	NNE	022.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "C"	NE	045.0	01.58	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "D"	ENE	067.5	01.37	SB, 2, 5, 10,15,20,30,40,50 distances
FM05	ENE	075.0	09.00	J.A. Woods Farms
DA04	ENE	071.9	11.62	Stotz Dairy Farm
DA05	ENE	071.9	11.61	Crosswinds Dairy
DA14	ENE	070.6	26.48	Advantage Farms
DA15	ENE	070.4	25.82	Eyherabide I
DA28	ENE	069.6	30.74	La Salvia, Jerome
OF03	ENE	066.0	35.00	APS El Mirage Office
DA16	ENE	081.4	21.37	Van Leeuwen, G.
Site Boundary "E"	E	090.0	01.34	SB, 2, 5, 10,15,20,30,40,50,60 distances
70E	E	090.0	70.00	Apache Junction
85E	E	090.0	85.00	E of Apache Junction
RS01	E	086.0	03.00	Adams Residence
OF01	E	097.0	15.00	APS Buckeye Office
OF02	E	084.0	30.00	APS Goodyear Office
FM03	E	088.0	15.00	Cambron Farm
FM04	E	095.0	09.00	Cooley Farms
DA01	E	092.6	11.06	A&H Dairy
DA02	E	087.3	10.72	Butler Living Trust
DA03	E	086.1	11.07	B&K Dairy
DA06	E	100.0	12.84	Kerr, William
DA07	E	087.4	17.31	Dickman Dairy
DA08	E	087.4	17.31	Eyherabide II
DA09	E	092.3	19.86	Kerr, David Dairy
DA10	E	093.4	20.04	Kerr, John W. Jr.
DA11	E	092.4	19.22	Lamcrest Enterprises
DA12	E	093.6	19.25	Tumbleweed Dairy
DA13	E	093.4	20.20	Hillcrest II
DA17	E	084.9	22.66	Desert View Dairy
DA18	E	088.8	23.69	Bolle & Henry Dairy
DA19	E	089.0	23.69	Heartland VI
DA20	E	092.2	20.82	Triple J (J. Kerr)
DA21	E	095.7	20.91	Dykstra Dairy
DA22	E	093.4	21.81	Botma, Randy
DA23	E	095.0	23.14	T&K Investments III
Site Boundary "F"	ESE	112.5	01.28	SB, 2, 5, 10,15,20,30,40,50 distances
SC01	ESE	105.0	11.00	Palo Verde School
RS02	ESE	106.0	04.00	Wedgeworth Residence
FM01	ESE	122.0	05.00	Desert Farms
DA25	ESE	104.1	22.28	Rainbow Valley North
DA26	ESE	104.1	22.28	Rainbow Valley South
DA24	ESE	100.6	21.66	Kuiper, Darrell
DA27	ESE	106.23	23.00	Western Sky Diary
Site Boundary "G"	SE	135.0	01.31	SB, 2, 5, 10,15,20,30,40,50 distances
SC03	SE	144.0	08.00	Arlington School
Site Boundary "H"	SSE	157.5	01.88	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "J"	S	180.0	01.68	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "K"	SSW	202.5	01.14	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "L"	SW	225.0	00.75	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "M"	WSW	247.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "N"	W	270.0	00.62	SB, 2, 5, 10,15,20,30,40,50 distances
SC04	W	281.0	22.00	Harquahala Valley School
Site Boundary "P"	WNW	292.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "Q"	NW	315.0	00.74	SB, 2, 5, 10,15,20,30,40,50 distances
MO2	NW	323.0	09.00	MacArthur's Farm
Site Boundary "R"	NNW	337.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
DY01-DY24	Variable	Variable	Variable	Available Dynamic Receptors

1.10.6 Back-calculating source term - Use of the F5 - Back-calculate Source Term? Selecting this will provide the "A" and "B" options on the Command Menu as follows:

1.10.6.1 OPTION "A" - Used to adjust specific area EDE/TEDE ratios. If Noble Gas and I/NG µCi/cc Iodine field air sample data in gross µCi/cc become available the "Press A to select the external EDE/TEDE ratio" option may be used. This option is of limited early use as Noble Gas Isotopic values are required.

- The prompts will be for (a) the noble gas and iodine levels in gross µCi/cc (an MCA analysis will be required for noble gas although gross iodine activity will be available from field frisker readings); (b) the distance the sample was taken in miles from Site; and (c) the angle the sample was taken in relation to "0" degrees North. Note that samples taken outside the sectors used in the projection will not be accepted.

- The completed calculation provides comparison between the actual and the projected air sample data at that point (in gross µCi/cc) as well as a specific external EDE/TEDE ratio for that sample area. Use the updated ratio for that team and make adjustments to the team dose limits as appropriate. Thyroid CDE will also be provided.

1.10.6.2 OPTION "B" - Use to develop data to update the source term: As the initial Field Team dose rates become available (closed window mRem/hr at a known distance from Site center and the angle between the field dose rate and "0" degrees North) they may be entered into Mesorem via the "Press B to select Back-calculation of source term" option. This.option will be of use during the early event phase as field dose rates will be the first information available defining the plume.

- The prompts will be for the field reading in mRem/hr (closed window); then the distance in miles from Site; and the angle the reading was taken in relation to "0" degrees North (Note that readings found outside the sectors used in the projection will not be accepted).

- The completed calculation provides the projected versus actual field reading at the same point for comparison; as well as projected and adjusted release rates. Several field samples should be collected prior to source term adjustment which is then done by repeated Mesorem Jr. runs until a "best fit" of the accumulated data is obtained.

1.10.7 Running a projection using grab sample data

1.10.7.1 Run projection as normal until the "Breakdown Menu" display appears - select: F1 - Grab Sample Analysis Complete: isotopic data from a stack or field sample is available, and the projection will be calculated based on a corrected mix per the grab sample activity.

- The prompt "Do you wish to utilize current isotopic mix?" may appear after you choose one of the following selections. The question is only asked after the initial projection in a series of projections has been run; and allows you to keep the current mix - (Y) - if you want to keep the current mix, or - (N) - if you want to change the current mix.

- Although the isotopic sample data entered will be used in this choice to calculate a projection dose, the program still prompts for an RMS reading. Reason: the monitor reading entry is used by Mesorem to calculate a comparison source term when you elect to change the mix concentrations or the release rates. After the mix concentrations or release rate data is entered and before the printout is done, Mesorem will display a message indicating whether the updated source term will be > or < than the source term the RMS reading would provide. The program will then ask if you want to continue the projection using the entered concentrations. This comparison provides the ability to work up a release per a specified mix that equates to a specific RMS monitor reading, via multiple backfit calculations. Normally you will enter "Y" to continue the projection.

1.10.7.2 Data entry - The program prompts for the entry of the RMS monitor information, process flow rate and filter efficiency. Answer the prompts. The "Isotopic Mix Menu" appears. On the "Isotopic Mix Menu," three choices are offered:

1. F1 enter isotopic grab sample activity by % of total. Enter the % abundance for the five iodine isotopes, followed by the 13 noble gas isotopes; remembering each group must total 100.

2. F2 enter sample activity in µCi/cc concentration by isotope. Enter the µCi/cc concentration for each isotope - the µCi/cc units are not noted, but that is the format to be used.

3. F3 enter sample activity in release rate by isotope. Enter the µCi/sec release rate for each isotope <u>not</u> µCi/cc.

1.10.7.3 Sample decay - For the "Enter the time that the sample was analyzed" prompt, be aware that the DECAY completed analysis will already have been decay corrected back to the sample collection time. Enter the time between reactor scram and sample collection; or "00:00" if reactor was critical at sample collection time.

1.10.7.4 Finish projection - Step through the remaining steps and the new calculation will reflect the updated mix.

1.10.8 Technical Basis Information

1.10.8.1 MESOREM, Jr. developmental references

1. EPA 400-R-92-001, "Manual of Protective Action Guides And Protective Actions for Nuclear Incidents," October 1991
2. EPA 520/1-88-020, "Federal Guidance Report No. 11 Limiting Values of Radionuclide Intake and Air Concentration and dose Conversion Factors for Inhalation, Submersion, and Ingestion," U.S. Environmental Protection Agency, 1988.
3. Reg Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I."
4. NUREG/CR-3344 (PNL-4753), "MESOI Version 2.0: An Interactive Mesoscale Lagrangian Puff Dispersion Model with Deposition and Decay," Pacific Northwest Laboratory, 1983.
5. NUREG/CR-2858, "PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations," November 1982.
6. NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", November 1980.
7. MESOREM, Jr. Background Materials, Program Documentation, Source Code, Programmers Manual, Software Validation Report, Site Verification, and Mesocode Book of Changes on file in the Emergency Planning Department.

1.10.8.2 Some basic information

- All releases are at ground level.
- The stability class is determined using a Delta T from the 35' and 200' Met tower readings.
- The FSAR isotopic mix values for 1% and 100% "Failed Fuel" LOCA and 1% and 100% SGTR are used as conservative for dose projections.
- Mesorem Jr. Chi/Q values are from Desert dispersion parameters as referenced in NUREG/CR-2858.

1.10.8.3 Projection type - In Mode "A", a straight line Gaussian plume projection is calculated and decay corrected doses are provided for the Site Boundary; 2, 5 and 10 mile distances.

1.10.8.4 Release rate determination - A Mesorem calculation is based on Site RMS indications. The current uCi/cc concentration per the release stack Noble Gas Monitor is input along with the flow through that release point. These are converted to a Noble Gas release rate; and the Iodine release rate is then calculated using the FSAR I/NG mix ratios. Iodine filtration efficiency is assumed to be 95% but may be entered as less if needed.

1.10.9 Definitions/Miscellaneous

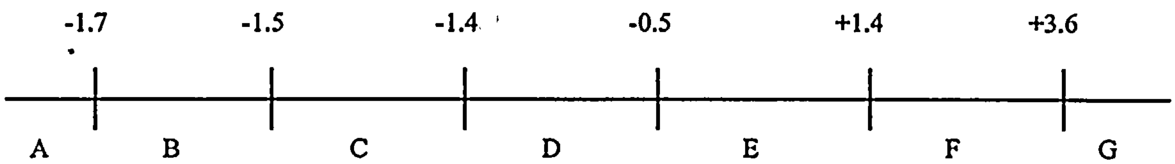
1.10.9.1 Meteorological tower data - The Site Meteorological Tower data needed for dose projection is available on ERFDADS; if the ERFDADS data is unavailable, there are two alternative sources of data prior to falling back on the "default" data entered into Mesorem Jr. The alternative choices should always be used if time permits.

- Choice 2: call the National Weather Service (602-379-4609 or 602-379-4611). They can provide Wind Speed, Wind Direction and Temperature based on information from the tower in the onsite SRP Switchyard area. Use that data to determine an appropriate delta "T" from the table below.

- Choice 1: send an Operator, I&C Tech or RP Tech out to the Met Tower to obtain the data locally: (keys to the tower area are available in Unit 1 and each RFAT).

1.10.9.2 Stability Classification - The delta T is calculated per the below formula in MESOREM Jr.

delta T in °F
If the delta T falls exactly on a number, use the class to the left.



1.10.9.3 The "Default" delta T entered in Mesorem Jr. is a +18 or "G" which is extremely stable but very overconservative in most cases. Therefore, if the Met Tower is unavailable and data can be obtained from the National Weather Service, a better stability class estimation can be used based on wind speed and time of day. Select the appropriate value from the table below and enter as "delta T" for Mesorem projections.

Alternative Delta "T" values for use with NWS Data

Wind Speed (mph)	Day (light)	Night (dim or dark)
<4	-1.6	+4
4-7	-1.4	+2
7-9	-1.4	+1
9-13	-1	-1
>13	-1	-1

References for above table are NUREG/CR-5247 (ORNL-6820) Vol.1, Rev. 2, "RASCAL Version 2.1 User's Guide", December 1994; and Turner, D.B. 1969, "Workbook of Atmospheric Dispersion Estimates". U.S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

1.10.9.4 Topography - Mesorem Jr. calculations include factoring in terrain elevation as the plume travels downwind. As the terrain heights vary smoothly within the 10 mile EPZ this is an un-noticed factor for the most part. At 306° to 309° however an initial rise to the Buckeye Hills begins at around the 8 - 10 mile distance. Because of this rise a plume modeled in that direction will show increased doses at 10 miles as compared to 5 miles, as the plume will be nearer to ground level at that distance. Because of this effect, be aware that dose will not always decrease with distance. Significant receptor sites should be looked at using the Receptor Display Menu or by using one of the Dynamic receptors (section 1.10.1).

1.10.9.5 Emergency Plan meter source check and calibration methodology.

- The Emergency Plan instruments are calibrated every 6 months by Cal Lab; source checked quarterly by the Cal Lab or RP Central; and checked for meter deflection with the button source to use.

- On removal of a meter from a kit for emergency use, the calibration sticker should indicate that calibration has been performed within the last 6 months. The white instrument response check record should indicate the full response check as being done within the last quarter. THE RESPONSE CHECK STICKER WILL NOT BE UPDATED EVERY MONTH AS ON THE UNIT METERS. DO NOT CHANGE THE STICKER as that will remove documentation of the full source check done.

- This methodology is used, as the sources to do the full required response check are not available at all of the Eplan Kits. Meters used in an actual event to determine protective dose rates will be taken to the Cal Lab after the event to have a followup source check done.

- The button source which is available in each kit is used to check for meter deflection on first use of the meter. A log entry indicating that sticker dates have been checked and deflection checks done should be made. A Tech should be assigned to do this initially on facility activation.

1.10.9.6 Definitions

- CDE - The Committed Dose Equivalent. In MESOREM, Jr. it is the dose equivalent to the thyroid that will be received from the inhalation of radioiodine in the plume by an adult during the 50-year period following the intake. In Mode B it includes particulates other than iodine.

- CEDE - The Committed Effective Dose Equivalent. In MESOREM, Jr. it is the sum of risk-weighted CDEs to the various organs or tissues of the body from the inhalation of radioiodine in the plume. In Mode B it includes particulates other than iodine.

- DDE - The Deep Dose Equivalent. This is an NRC term, required for 10CFR20 compliance in substitution for the internationally-accepted external EDE. DDE applies to external whole-body exposure, that is uniform irradiation from an external source, and is the dose equivalent at a tissue depth of 1 centimeter (1,000 mg/cm2).

- EDE - The Effective Dose Equivalent. In MESOREM, Jr., external EDE printouts are for external exposure due to plume immersion. Mode A PAR calculations also include external EDE from iodine deposition. Per NUMARC guidance, the external dose equivalent (which is directly measurable) is an appropriate substitute for external EDE and puts an upper bound on the 10CFR20 quantity "Deep Dose Equivalent" ("DDE").

- SDE - The Shallow Dose Equivalent. For the purposes of this paper it is the dose equivalent to the skin, from external exposure, at a tissue depth of 0.007 centimeters (a density-thickness of 7 milligrams per square centimeter).

- TEDE - The Total Effective Dose Equivalent, the sum of external EDE plus CEDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE in MESOREM Jr. is from immersion only.

- TODE - The Total Organ Dose Equivalent, the sum of external EDE plus thyroid CDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE component in MESOREM, Jr. is from immersion only. By NRC definition, TODE only applies to the organ receiving the highest dose; excluding particulate releases, for PVNGS' credible accidents this organ is the thyroid.

1.10.9.7 Shelter Dose - Shelter Doses are due to external exposure from plume immersion, committed internal dose from plume inhalation, and 96-hours of external exposure from that ground deposition which is projected for the projected plume duration; each of these components of dose increases with increased Release Duration. The 96-hour ground shine contribution is specified in EPA 400.

- The first results summary screens or pages of Mesorem Jr. output give external EDE rate in mRem/hour at Site Boundary and at 2-, 5-, and 10-miles; this is external EDE due to plume immersion only.
- The complete external EDE component (i.e., plume immersion and ground shine) of Shelter Dose TEDE and Shelter Dose TODE is calculated within Mesorem Jr. and is included in the PAR summary output of TEDE and TODE. The Site Boundary PAR output is automatic.
- Shelter Dose TEDE is calculated by multiplying the centerline Shelter Dose TEDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose TODE is calculated by multiplying the sum of the external EDE rate due to immersion and the thyroid CDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose thyroid CDE is calculated by multiplying the thyroid CDE rate for the specified receptor location by the release duration.
- No credit is taken in MESOREM, Jr. for shelter Dose Reduction Factors (DRFs of 1 are used); one may view shelter dose as the dose received by individuals in the plume center with no shelter.

1.10.9.8 Evacuation Dose - Evacuation Doses are due to external exposure from plume immersion and committed internal dose from plume inhalation. Ground deposition is not really involved, but is included in MESOREM, Jr. This is equivalent to the EPA 400 provision for use of "Combined Pathway" Dose Conversion Factors.

- The Plume Exposure Time is the Evacuation Time Estimate (2.9 hours for normal weather, 3.3 hours for adverse weather conditions) minus the Plume Arrival Time to the receptor site. Plume Exposure Time used in Evacuation Dose projections made via MESOREM, Jr. will not exceed the Evacuation Time Estimate (2.9 hours or 3.3 hours).
- The Plume Arrival Time is the sum of Plume Travel Time (upwind distance from receptor to release point, divided by wind speed) plus Time Until Release Begins (set equal to zero if release has begun). That is:
- Plume Exposure Time
- Evacuation Time - Plume Travel Time - Time Until Release Begins
- Both Plume Exposure Time and Evacuation Time begin at the time of the dose projection.
- This equation is not applicable to Shelter Dose projections; in Shelter Dose projections Plume Exposure Time is equal to Release Duration and has a user-specified value.)
- When the Evacuation Dose receptor location is already in the plume, Plume Travel Time will be zero, Time Until Release Begins will also be zero, and projected Plume Exposure Time will equal the Evacuation Time Estimate. Plume Exposure Time can be zero; MESOREM, Jr. will show <0.02 mrem Evacuation Doses for such locations, while still recommending evacuation when appropriate, even when Plume Exposure Time = zero at the Site Boundary.
- Evacuation Doses are determined by Plume Exposure Time:
- The TEDE Evacuation Dose is the 4-day external EDE from deposition plus the product of the TEDE rate multiplied by the Plume Exposure Time.
- The Thyroid CDE Evacuation Dose is simply the thyroid CDE rate multiplied by the Plume Exposure Time.
- The TODE Evacuation Dose is the 4-day external EDE from deposition plus the product of the sum of the thyroid CDE rate and the external EDE rate due to immersion multiplied by the Plume Exposure Time.

Appendix S - Abbreviations

1.0 ABBREVIATIONS

ACAD	-	Automatic Control Access Device
ADV	-	Atmospheric Dump Valve
AgX	-	Silver Zeolite
ALARA	-	As Low As Reasonably Achievable
AO	-	Auxiliary Operator
ARRA	-	Arizona Radiation Regulatory Agency
ASCII	-	American Standard Code for Information Interchange
CARS	-	Condenser Air Removal System
CAS	-	Central Alarm Station
CC	-	Cubic Centimeter
CDA	-	Core Damage Assessment
CDE	-	Committed Dose Equivalent
CET	-	Core Exit Thermocouple
CFR	-	Code of Federal Regulations
Ci	-	Curie
CRS	-	Control Room Supervisor
CSF	-	Critical Safety Function
CTMT	-	Containment
CW	-	Closed Window
DAC	-	Derived Air Concentration
DAT	-	Digital Audio Tape
DCF	-	Dose Conversion Factor
DDE	-	Deep Dose Equivalent
EAL	-	Emergency Action Level
EC	-	Emergency Coordinator
ECC	-	Energy Control Center
ECL	-	Emergency Classification Level
EDE	-	Effective Dose Equivalent
EDG	-	Emergency Diesel Generator
EOF	-	Emergency Operations Facility
EOP	-	Emergency Operating Procedure
ENS	-	Emergency Notification System
EPA	-	Environmental Protection Agency
ERDS	-	Emergency Response Data System
ERFDADS	-	Emergency Response Facility Data Acquisition and Display System
ESF	-	Emergency Safety Features
FBEVAS	-	Fuel Building Essential Ventilation Actuation Signal
FPB	-	Fission Product Barrier
FTS	-	Federal Telecommunications System
GE	-	General Emergency
GPD	-	Gallons Per Day
GPM	-	Gallons Per Minute

H2	-	Hydrogen
HDD	-	Hard Disk Drive
HECA	-	High Efficiency Charcoal Assembly
HEPA	-	High Efficiency Particulate Assembly
HPID	-	Health Physics IDentification
HPSI	-	High Pressure Safety Injection
I	-	Iodine
IC	-	Initiating Condition
KI	-	Potassium Iodide
LAN	-	Local Area Network
Lbm	-	Pounds Mass
LCO	-	Limiting Condition for Operation
LOAF	-	Loss Of All Feed
LOCA	-	Loss Of Coolant Accident
LPSI	-	Low Pressure Safety Injection
μCi	-	MicroCurie
MMI	-	Man-Machine Interface
MPH	-	Miles Per Hour
mRem	-	MilliRem
MS-DOS	-	MicroSoft Disk Operating System
MSSS	-	Main Steam Support Structure
MSSV	-	Main Steam Safety Valve
MST	-	Mountain Standard Time
MW	-	MegaWatt
NAN	-	Notification Alert Network
NG	-	Noble Gas
NPSH	-	Net Positive Suction Head
NRC	-	Nuclear Regulatory Commission
NUE	-	Notification of Unusual Event
NUMARC	-	Nuclear Management and Resource Council, Inc.
NWS	-	National Weather Service
OBE	-	Operating Basis Earthquake
OCS	-	Operations Computer Systems
ODCM	-	Offsite Dose Calculation Manual
OSC	-	Operations Support Center
OW	-	Open Window
PAG	-	Protective Action Guide
PAR	-	Protective Action Recommendation
PASP	-	Preplanned Accident Sampling Program
PBX	-	Private Branch eXchange
P/S	-	Primary to Secondary
PSIA	-	Pounds per Square Inch Absolute
PVNGS	-	Palo Verde Nuclear Generating Station
QSPDS	-	Qualified Safety Parameter Display System
R	-	Rem
RAS	-	Recirculation Actuation Signal
RASCAL	-	Radiological Assesment System for Consequence AnaLysis

RCP	-	Reactor Coolant Pump
RCS	-	Reactor Coolant System
RFAT	-	Radiological Field Assessment Team
RMS	-	Radiation Monitoring System
RO	-	Reactor Operator
RP	-	Radiation Protection
RPM	-	Radiation Protection Monitor
RPS	-	Reactor Protection System
RRACS	-	Radiological Records and Access Control System
RVLMS	-	Reactor Vessel Level Monitoring System
SAE	-	Site Area Emergency
SBCS	-	Steam Bypass Control System
SCF	-	Standard Cubic Feet
SG	-	Steam Generator
SGTR	-	Steam Generator Tube Rupture
SIAS	-	Safety Injection Actuation Signal
SID	-	Self-Indicating Dosimeter
SM	-	Shift Manager
SPDS	-	Safety Parameter Display System
SRO	-	Senior Reactor Operator
SSE	-	Safe Shutdown Earthquake
SSN	-	Social Security Number
STA	-	Shift Technical Advisor
STSC	-	Satellite Technical Support Center
TEDE	-	Total Effective Dose Equivalent
TLD	-	ThermoLuminiscent Dosimeter
TODE	-	Total Organ Dose Equivalent
TSC	-	Technical Support Center
UFSAR	-	Updated Final Safety Analysis Report
USNRC	-	United States Nuclear Regulatory Commission
WGDT	-	Waste Gas Decay Tank
XFMR	-	Transformer

9909280427

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-02	**016**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIP-07		17-027I	RADIOLOGICAL ASSESSMENT COMMUNICATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027J	PLANT STATUS TECHNICIAN	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027K	SECURITY COORDINATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027M	GOVERNMENT LIASON	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Q	EMERGENCY OPERATIONS DIRECTOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027R	DOSE ASSESSMENT HEALTH PHYSICIST	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Y	SHIFT TECHNICAL ADVISOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-08		05-015	SUPV-STDS	H/DAWPS-BLDG	PW	1	
EPIP-08		17-027	DISTRICT-MANAGER	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!

Remarks
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Procedure Number	Revision #	Effective Date
EPIP-02	**016**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
EPIPS		00-000	WOLFE,W	X/STA-6050	PW	1	
EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
EPIPS		00-000	SMITH,D	X/STA-7294	PW	1	
EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
EPIPS		00-000	SONTAG, M	X/STA-7997	PW	1	
EPIPS		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	SPENCER,B	Y/MARICOPA CNTY DEPT OF EMERG MGMT 2035 N 52ND ST PHX AZ 85008	PW	1	
EPIPS		00-000	PORTER,J CAPTAIN	Y/MARICOPA CO SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	

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EPIP-02	**016**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	
EPIPS		05-025		B/UII-CR	PW	1	
EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	

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EPIP-02	**016**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
EPIPS		15-002	CAS	D/SEC-BLDG	PW	1	
EPIPS		15-003	SAS	D/SEC	PW	1	
EPIPS		17-001		C/ANX-DW-EOF-LIB	PW	1	
EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

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PROCEDURE INTENT

This procedure provides functional instruction for the activation and operation of the Operations Support Center

rev	description
16	This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16DP-0EP16	Operations Support Center Actions
16DP-0EP18	Accident Sampling
16TD-0EP012	Assembly
16TD-0EP041	Dose Projection
16TD-0EP051	Emergency Exposures and KI
16TD-0EP161	Protective Actions
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1.0 OBJECTIVE

This procedure provides functional instruction for the activation and operation of the Operations Support Center (OSC). It should be referenced anytime the OSC is activated. It should also be referenced by other Emergency Response personnel when responding to that facility during any classified emergency event.

2.0 LIMITATIONS AND PRECAUTIONS

2.1 On backshift and weekends, the entire Onshift Emergency Response Organization (ERO) staff will be activated by the EC. The ERO Staff will function as required by the event and base their operations primarily from the STSC area to facilitate briefings and control. When an OSC Coordinator and Repairs Coordinator arrive as augmented personnel, the activation of the OSC will be declared to ensure communications are established with the EOF and TSC, and to indicate that the required augmented staff is available.

2.2 If the OSC becomes uninhabitable, the OSC Coordinator should select an Unaffected Unit OSC as an alternate, with the assistance of the Radiation Protection Technician.

2.3 The following condition in the plant can affect an emergency classification and should immediately be reported to the Radiological Protection Coordinator or Emergency Coordinator in the Technical Support Center when verified: Any unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the Unit.

3.0 OPERATIONS SUPPORT CENTER (OSC) COORDINATOR ACTIONS

3.1 Initial Actions

3.1.1 When duties have been assumed and an informational briefing has been received, contact the PVNGS Fire Department and direct the Fire Protection Senior Emergency Services Officer to remain available at the Fire Department to assume duties as required.

3.1.2 Record the time and activate the Operations Support Center when the following required facility personnel have arrived:

- Radiation Protection Technician
- Repairs Coordinator

Time: ______________________________

3.1.3 When facility emergency response personnel have assumed their duties and responsibilities, notify the Emergency Coordinator and facility staff that the Operations Support Center has been activated.

3.1.4 Periodically brief the Operations Support Center staff on the following items:

- current plant conditions
- use of the ACAD card reader
- responsibilities to remain in the facility activation area
- facility evacuation precautions to be taken, if required
- use of the Radiation Protection work area
- use of this procedure by facility staff

3.2 Subsequent Actions

3.2.1 In-Plant and Protected Area Repair Team Dispatch and Control

3.2.1.1 Coordinate repetitive implementation of the following with the RP in the OSC and the Repairs Coordinator to prepare and dispatch In-Plant and Protected Area Teams:

3.2.1.1.1 Keep the TSC Emergency Maintenance Coordinator advised on all personnel resource availability.

3.2.1.1.2 Prioritize team entries and dedicate resources per the following guidelines and IAW the TSC direction:

Primary:

- Immediate entry needed for life or equipment saving
- 10 CFR 20 exposure limits may be exceeded
- Appendix K, Emergency exposures and KI may be involved (RPM/RPC responsibility)
- Radiation Protection personnel will accompany the team.

Secondary:

- No life or equipment saving actions
- PVNGS Administrative Exposure Hold Points may be exceeded
- Appendix K, Emergency exposures and KI may be involved (RPM/RPC responsibility)
- A pre-entry survey will be completed

Normal:

- No life or equipment saving actions
- No dose limits exceeded

3.2.1.1.3 Conduct or direct briefings with team members (the Repairs Coordinator and RP will assist for specific job detail). Establish radiation protection equipment requirements and identify any hold (or abort) points at significant segments for the mission.

3.2.1.1.4 Use the EP-0131 Briefing Forms (see Appendix C) to document each team dispatch and each team debrief on their return.

3.2.1.1.5 If assembly has been ordered, assume duties as the Operations Support Center Assembly Area Supervisor.

3.3 Terminal Actions

3.3.1 Collect logs, data, and other documentation from facility personnel and submit them to the Incident Investigation Team After event termination.

4.0 CHEMISTRY TECHNICIAN ACTIONS

4.1 Initial Actions

4.1.1 Report to the OSC (STSC onshift) and card in. When duties have been assumed and an informational briefing has been received, return to the chemistry lab and perform actions as requested by the ERO and procedural requirements.

4.1.2 Render assistance and support for duties as assigned.

4.2 Subsequent Actions

4.2.1 Conduct accident sampling as necessary in accordance with Appendix L, Accident Sampling.

4.3 Terminal Actions

4.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

5.0 ELECTRICAL MAINTENANCE TECHNICIAN

5.1 Initial Actions

5.1.1 Report to the OSC (STSC onshift) and card in. After an informational briefing has been received, provide support functions as required to assist in activation of the facility.

5.2 Subsequent Actions

5.2.1 Render assistance and support for duties as assigned.

5.3 Terminal Actions

5.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

6.0 FIRE PROTECTION / EMERGENCY MEDICAL TECHNICIAN

NOTE

Though the Fire Protection / Emergency Medical Technician is a required position for Operations Support Center activation, support functions for facility activation can be established at the Fire Department. Proceed to the Operations Support Center only when deemed necessary or as directed.

6.1 Initial Actions

6.1.1 When contacted by the Operations Support Center Coordinator regarding Operations Support Center activation, initiate fire protection / medical response support functions as required to assist in activation of the facility.

6.2 Subsequent Actions

6.2.1 Render fire protection assistance and medical support as necessary.

6.3 Terminal Actions

6.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

7.0 INSTRUMENTATION AND CONTROL TECHNICIAN

7.1 Initial Actions

7.1.1 Report to the OSC (STSC onshift) and card in. After an informational briefing has been received, provide support functions as required to assist in activation of the facility.

7.2 Subsequent Actions

7.2.1 Render assistance and support for duties as assigned, including In-Plant and Protected Area Repair Teams and team support.

7.3 Terminal Actions

7.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

8.0 MECHANICAL MAINTENANCE TECHNICIAN

8.1 Initial Actions

8.1.1 Report to the OSC (STSC onshift) and card in. After an informational briefing has been received, provide support functions as required to assist in activation of the facility.

8.2 Subsequent Actions

8.2.1 Render assistance and support for duties as assigned.

8.3 Terminal Actions

8.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

9.0 RADIATION PROTECTION TECHNICIAN

9.1 Initial Actions

9.1.1 When duties have been assumed and coordinated briefings have been completed with the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Protection Coordinator in the Technical Support Center, establish responsible work area(s) at the OSC. Note the following:

9.1.1.1 RP Tech qualifications vs. typical tasks

Typical Tasks (per JQC validation)	Full Qualified RP Tech	Task Qualified Support Tech
Search and Rescue Team	x	
Repair Team	x	
Offsite Survey Team	x	
Contaminated Injury (14DP-0FP11)	x	
Reassembly Area operations	x	
Onsite/Inplant Survey Team	x	x

9.1.1.2 Assess the status of radiological parameters that may affect team safety or the performance of radiological surveys.

9.1.1.3 Establish radiological controls in the Operations Support Center area and at the Radiation Protection Island for current radiological conditions.

9.1.1.4 As necessary, consult with the Radiation Protection Monitor in the Satellite Technical Support Center, the Radiological Protection Coordinator in the Technical Support Center, and the Radiological Assessment Communicator in the Emergency Operations Facility to assess and coordinate the radiological response to current conditions.

9.1.1.5 In-Plant and Protected Area Repair Team Radiological Support

Coordinate repetitive implementation of the following with the Operations Support Center Coordinator and the Repairs Coordinator or Radiation Protection Monitor to prepare the radiological support necessary for In-Plant and Protected Area Teams:

9.1.1.5.1 Keep the OSC Coordinator advised on Radiation Protection personnel resource availability.

9.2 Subsequent Actions

9.2.1 Prioritize team entries and dedicate resources per the following guidelines and IAW the EC's direction:

Primary:

- Immediate entry needed for life or equipment saving
- 10 CFR 20 exposure limits may be exceeded
- Appendix K, Emergency exposures and KI may be involved (RPM/RPC responsibility)
- Radiation Protection personnel will accompany the team.

Secondary:

- No life or equipment saving actions
- PVNGS Administrative Exposure Hold Points may be exceeded
- Appendix K, Emergency exposures and KI may be involved (RPM/RPC responsibility)
- A pre-entry survey will be completed

Normal:

- No life or equipment saving actions
- No dose limits exceeded

9.2.1.1 Conduct a briefing with team members (the Repairs Coordinator will assist for specific job detail). Establish radiation protection equipment requirements and identify any hold (or abort) points at significant segments for the mission.

9.2.1.2 Use the EP-0131 Briefing Forms (see Appendix C) to document each team dispatch and each team debrief on their return.

9.2.2 Radiological Field Assessment Team (RFAT) Dispatch

9.2.2.1 Select RFAT Team members and give them initial radiological and meteorological information to safely reach the RFAT vehicle. A driver from the Water Reclamation Facility may be used during Onshift response (WRF Control Room 3007/3002). The driver should be given an initial briefing on the telephone.

9.2.2.2 Instruct the field team members to proceed to their Radiological Field Assessment Team vehicles and establish radio communication.

9.2.2.3 When vehicle radio communications checks have been completed, provide a specific briefing to team members regarding current survey requirements, current radioactive release details and survey assignments.

9.2.2.4 If any of the below thresholds are found to be met or exceeded, the RFAT Team shall immediately inform either the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Assessment Coordinator in the Emergency Operations Facility. These may impact the current classification and must be passed to the Emergency Coordinator as soon as possible.

Threshold	Site Boundary Dose Rate
NUE	0.1 mRem/hr Deep Dose Equivalent
Alert	1.0 mRem/hr Deep Dose Equivalent
SAE	100 mRem/hr Deep Dose Equivalent 500 mRem/hr Thyroid CDE
GE	1000 mRem/hr Deep Dose Equivalent 5000 mRem/hr Thyroid CDE

9.2.2.5 RFAT Teams will locate and track the radioactive plume by determining plume edge and centerline dose rates and surveying as directed. The criteria for Emergency Action Levels are based on Plume Centerline values; therefore varying dose rates or changing conditions shall be immediately brought to the attention of the RAC.

The following indications of a plume are typical:	
Slowly increasing dose / count rate:	approaching plume edge
Sharp increase in dose rate:	reached plume edge
Highest instrument reading:	reached plume centerline
Open window > closed window reading:	immersed in plume
Open window = closed window reading:	plume overhead (shine)
Ground level > waist level reading:	ground deposition present

9.2.2.6 Once the plume is located, the RFAT Team will radio in their current location and plume information, and obtain specific direction on dose rates and air samples to be taken. The RFAT Teams will supply only OW/CW dose rate readings; beta corrections to actual dose will be done onsite.

9.2.2.7 RFAT air sampling shall be performed in accordance with 75RP-9RP07, Radiological Surveys. <10 cubic feet air samples may be taken for ALARA considerations.

9.2.2.8 RFAT iodine cartridges should be purged in clean air for 30 seconds after sampling to aid in removal of noble gases.

9.2.2.9 All dose rates and air sample calculations performed by the field team members shall be documented on Form EP-0481, Air Sample Data (see Appendix C).

9.2.2.10 RFAT Team members are responsible for monitoring their individual doses and ensuring they remain within the limits set by the RPM/RAC Staff.

9.2.3 Ensure that dose rate meters from the emergency kit are transmitted to the calibration facility for calibration and required maintenance.

9.3 Terminal Actions

9.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

10.0 RADIOLOGICAL MONITORING TECHNICIAN

10.1 Initial Actions

10.1.1 Report to the OSC (STSC onshift) and card in. When duties have been assumed and an informational briefing has been received, establish a responsible work area in the RM Effluents Office.

10.1.2 Contact all unaffected unit RM Technicians, brief them and request assistance.

10.1.3 Perform initial RMS monitoring to determine any release indications, or Protected Area and In-Plant area airborne and dose rate increases. Inform the Radiation Protection Monitor and Emergency Coordinator in the Satellite Technical Support Center of initial conditions.

10.2 Subsequent Actions

10.2.1 Perform In-Plant and Protected Area surveys as assigned by the EC.

10.2.2 Perform ongoing RMS monitoring to determine any release indications, or Protected Area and In-Plant area airborne and dose rate increases. Inform the RPM (or RPC and RAC as the TSC and EOF are activated) of changes.

10.2.3 Provide the current phone numbers in use to keep the Radiation Protection Monitor in the Satellite Technical Support Center, the Radiological Protection Coordinator in the Technical Support Center, and the Radiological Assessment Coordinator in the Emergency Operations Facility advised of radiological conditions and Radiation Monitoring System trends.

10.3 Terminal Actions

10.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

11.0 REPAIRS COORDINATOR

11.1 Initial Actions

11.1.1 Report to the OSC (STSC onshift) and card in. After an informational briefing has been received, establish communications with the Emergency Maintenance Coordinator in the Technical Support Center, if staffed.

11.2 Subsequent Actions

11.2.1 As the need arises and when requested, select and organize repair teams with the assistance from the Operations Support Center Coordinator and Radiation Protection personnel. (The key to the Hot Tool Crib is located in the Radiation Protection Island locker.)

11.2.2 For each team, designate a team leader and initiate a Form EP-0131, Briefing Form (see Appendix C).

11.2.3 Assist the Operations Support Center Coordinator and the Radiation Protection Tech with repair team briefings, providing support for team communications as required.

11.2.4 As teams return to the OSC, ensure that team debriefings are completed and documented on the original team Form EP-0131 (see Appendix C).

11.3 Terminal Actions

11.3.1 Submit logs, data, and other documentation to the Operations Support Center Coordinator after event termination.

Appendix A - Emergency Action Levels

1.0 Precautions and limitations

1.1 The Emergency Action Levels in this section each incorporate an Emergency Action Level Identification Code (i.e., nn-nn) immediately following the Emergency Action Level statement. This code functions as a cross-reference to the PVNGS Emergency Action Level Technical Bases in Appendix Q - EAL Technical Bases. The first number corresponds to the EAL table number in this section. The second number corresponds to the sequential EAL within that table. The identification code number is also employed as data on PVNGS Emergency Message Forms.

1.2 Each entry in this section incorporates the industry generic Initiating Condition (IC) and the plant specific Emergency Action Level. The Initiating Condition should be reviewed to ensure the significance addressed by the Emergency Action Level is taken into consideration.

1.3 The plant operating Mode that existed at the time the event occurred, prior to any protective system or operator action initiated in response to the condition, is the applicable Mode of the Emergency Action Levels. If an event occurs, and a lower or higher plant operating Mode is reached before the emergency classification can be made, the declaration shall be based on the Mode that existed at the time the event occurred.

1.4 If a conflict exists in the classification level due to an Emergency Action Level discrepancy, the Emergency Action Level most accurately describing the condition should be applied when classifying the event.

1.5 If an indication of barrier challenge or failure exists which is inconsistent with the current emergency classification, rediagnose plant conditions and implement the emergency classification indicated.

1.6 If a more severe Fission Product Barrier "LOSS" Category in Section 3 has been met, then assume the "POTENTIAL LOSS" criteria of the associated category has been automatically satisfied.

1.7 Used in the context of a steam generator tube rupture as stated in the Fission Product Barrier Emergency Action Level [1-7], a "prolonged release of contaminated secondary coolant" encompasses a main steam line break, feedwater line break, stuck open steam generator safety and/or atmospheric dump valve(s), and plant cooldown (i.e., to Mode 5) while steaming the affected steam generator to atmosphere.

2.0 Instructions

2.1 Evaluate the following tables and determine the most accurate Emergency Action Level which is currently being met or exceeded.

Table 1: Fission Product Barrier Reference (Modes 1-4)

FUEL CLAD BARRIER		RCS BARRIER		CONTAINMENT BARRIER	
POTENTIAL LOSS	LOSS	POTENTIAL LOSS	LOSS	POTENTIAL LOSS	LOSS
Highest valid CET temperature > 700°F [1-1] RVLMS level < 21% plenum [1-2]	Highest valid CET temperature > 1200°F [1-1] RCS activity > 300 µCi/gm Dose Equivalent I-131 [1-3] CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr, or RU-149 > 1.8E+06 mrem/hr [1-4]	RCS leak > 44 gpm [1-6] SGTR > 44 gpm [1-7] LOAF such that minimum acceptable feedwater flow cannot be maintained [1-8]	RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling, i.e., RCS at saturation conditions [1-6] SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1) [1-7]	CTMT pressure 50 psig and increasing [1-10] CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating [1-10] CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr, or RU-149 > 8.7E+09 mrem/hr [1-11] H2 concentration > 3.5% by volume [1-10] CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored within 15 min. [1-12]	Rapid unexplained CTMT pressure decrease following initial increase [1-10] CTMT pressure or sump level response not consistent with LOCA conditions [1-10] Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists [1-13] Release of contam. Secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage [1-14]
Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier [1-5]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier [1-9]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier [1-15]	

APPLY THE CRITERIA ABOVE TO THE CONDITIONS BELOW	
UNUSUAL EVENT (NUE)	Any loss OR any potential loss of Containment
ALERT	Any loss OR any potential loss of either Fuel Clad or RCS
SITE AREA EMERGENCY (SAE)	Loss of both Fuel Clad and RCS OR potential loss of both Fuel Clad and RCS OR potential loss of either Fuel Clad or RCS AND loss of any additional barrier
GENERAL EMERGENCY (GE)	Loss of any two barriers AND potential loss of a third barrier

Table 2: Electrical Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Loss of All Offsite Power to Essential Buses for > 15 Minutes Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses [2-1]	**IC - AC Power Capability to Essential Buses Reduced to a Single Power Source for > 15 Minutes Such That Any Additional Single Failure Would Result in Station Blackout** Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition: Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG) **OR** Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR) [2-3]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4 [2-5]	**IC - Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4 **AND** Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated [2-7]
IC - Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for > 15 Minutes Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled [2-2]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses During Cold Shutdown or Refueling Mode** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled [2-4]	**IC - Loss of All Vital DC Power** Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4 [2-6]	

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer OR Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-1]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-8]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-14]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-17]
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer OR Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-2]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-9]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-15]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-18]

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Unplanned radioactivity release which results in Site Boundary dose rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-3]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Unplanned radioactivity release which results in Site Boundary dose rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-10]		
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Site Boundary dose rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-4]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Site Boundary dose rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-11]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** Site Boundary dose rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary [3-16]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** Site Boundary dose rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary [3-19]

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit [3-5] (normal levels comprise the highest reading in the past 24 hours excluding the current peak value)	**IC - Release of Radioactive Material or Increases in Radiation Levels within the Facility that Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are: (1) > 15 mR/hr: RU-18 Control Room OR (2) > 5000 mR/hr: RU-155 Main Steam Support Structure RU-153c Auxiliary Bldg. 100' East RU-23 Chemistry Hot Laboratory RU-19 Fuel Building [3-12]		
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water [3-6]	**IC - Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel** Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal, i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication, such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur **AND** Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145 [3-13]		
IC - Fuel Clad Degradation RCS specific activity > Technical Specification allowable limits [3-7]			

Table 4: Leakage Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - RCS Leakage Unidentified or pressure boundary leakage> 10 gpm in Modes 1-4 [4-1]			
IC - RCS Leakage Identified leakage > 25 gpm in Modes 1-4 [4-1]			

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room for > 15 Minutes Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available [5-1]	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate a Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2 [5-4] (manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS Bus from the Control Room)	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2 [5-7]	**IC - Failure of Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is an Indication of an Extreme Challenge to the Ability to Cool the Core** Failure of RPS to complete an automatic reactor shutdown, i.e., subcritical, and manual shutdown was not successful when in Modes 1-2 AND CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained [5-11]
IC - Inability to Reach Required Shutdown Within Technical Specification Limits Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4 [5-2]	**IC - Inability to Maintain Plant in Cold Shutdown** Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6 [5-5]	**IC - Loss of Water Level in the Reactor Vessel that Has or Will Uncover Fuel in the Reactor Vessel** Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 40AO-9ZZ02, Excessive RCS Leakrate and Safety Analysis Operational Data) [5-8]	

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio [5-3]	**IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room with Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable** Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress [5-6]	**IC - Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown** Loss of any function, i.e., heat removal, reactivity control, or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4 [5-9]	
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system [5-3]		**IC - Inability to Monitor a Significant Transient in Progress** Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available [5-10]	

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification [6-1]	**IC - Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown** Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-9]	**IC - Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established** Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes [6-18]	
IC - Natural and Destructive Phenomena Affecting the Protected Area Explosion affecting the Protected Area resulting in visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-2]	**IC - Control Room Evacuation Has Been Initiated** Entry into 40AO-9ZZ18, Shutdown Outside the Control Room, or 40AO-9ZZ19, Control Room Fire, for Control Room evacuation [6-10]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area [6-3]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Vehicle/aircraft crash or missile impact affecting plant vital areas [6-11]		
IC - Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant [6-4]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Visible structural damage to any building containing safe shutdown equipment [6-12]		

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals [6-5]	**IC - Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses [6-13]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Valid "Strong Motion Accelerometer SystemTrigger" Indicated on Seismic Warning Panel per 79IS-9SM01 [6-6]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment [6-14]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Tornado affecting the Protected Area [6-7]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity [6-15]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Flooding affecting the Protected Area [6-8]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58 [6-16]		
	IC - Natural and Destructive Phenomena Affecting the Plant Vital Area Flooding potentially affecting safety systems required for the current operating Mode [6-17]		

Table 7: Security Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant [7-1]	**IC - Security Event in a Plant Protected Area** Security event within the Protected Area (RE: 40DP-0OP07) [7-2]	**IC - Security Event in a Plant Vital Area** Security event within any vital area (RE: 40DP-0OP07) [7-3]	**IC - Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown** Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel [7-4]

Table 8: Miscellaneous Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Control Room assessment that an event has occurred affecting the Protected Area [8-1]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Control Room assessment that an event has occurred affecting the plant vital areas [8-3]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate actual or likely major failure of plant functions needed for protection of the public [8-5]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a General Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate: (1) actual or imminent substantial core degradation with potential for loss of CTMT, or (2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary [8-6]
IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event Other conditions exist which, in the judgment of the SM/EC, indicate a potential degradation of the level of safety of the plant [8-2]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert** Other conditions exist which, in the judgment of the SM/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted [8-4]		

Appendix B - Protective Action Recommendations

1.0 Precautions and limitations

1.1 In the event of a declaration of General Emergency, the response by the State of Arizona may involve actions to evacuate the public to include citizens out to ten miles in the Emergency Planning Zone. Note that the state's Protective Action Decision may differ from the site's Protective Action Recommendation.

1.2 The protective actions determined within this document are provided to offsite agencies as recommendations. Offsite agencies may employ conservative adjustments prior to issuing Protective Action Decisions. For this reason, it is essential that protective actions recommended to offsite agencies by PVNGS are accurate.

1.3 Environmental Protection Agency guidance stresses evacuation in lieu of shelter whenever possible. Shelter is appropriate only when evacuation cannot be implemented or when the duration of the release is expected to be shorter than the time period required to evacuate.

1.4 A Protective Action Recommendation may be based on the current emergency classification, current plant conditions, or on a dose projection. When a dose projection is unavailable or not applicable, the Protective Action Recommendation should be based on the current emergency classification or plant conditions.

1.5 The Emergency Operations Director shall be informed of the basis for all recommended protective actions submitted for issuance to the State of Arizona. The information should include any default or abnormal data used to determine the recommended protective action and a clarification of the effect these values may have on the recommended protective action.

1.6 If wind direction is unavailable from installed instrumentation and cannot be clearly determined by alternate means, e.g., the Unit 1 STA link to the RG system, the Protective Action Recommendation must be applied to all sectors. If ERFDADS is unavailable, meteorological information required by the Radiological Monitoring Technician can be obtained by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS. For this case, Delta-T will be derived by the Radiological Monitoring Technician. The Radiation Protection Monitor should ensure that the Emergency Coordinator is informed and that someone is sent to the Meteorological Tower for resolution of failure and to obtain local data, if possible.

2.0 PAR determination

2.1 Application of emergency classification

2.1.1 If any radiological thresholds in Section step 2.0 of Appendix A - Emergency Action Levels, exceed those which are appropriate for the current emergency classification, immediately inform the Emergency Coordinator that radiological conditions exist which warrant an escalation in the current emergency classification.

2.1.2 Using the PAR Table, ensure that the current Protective Action Recommendation meets the minimum required for the current emergency classification.

2.2 Application of plant conditions

2.2.1 Based on bounding projections for plant conditions, review possible radiological release paths / source terms with technical staff members.

2.2.2 If Radiological Field Assessment Team data is available, compare Site Boundary dose rates and sample results with the projections previously reviewed and select the most accurate Protective Action Recommendation appropriate to current plant conditions.

2.2.3 Compare the Protective Action Recommendation selected in the previous step with that selected as the minimum required for the current emergency classification and select the most conservative Protective Action Recommendation.

2.3 Application of dose projection

2.3.1 If dose projection results are available, compare the recommended protective action based on the most recent dose projection to that selected as the most conservative in the previous step and select the most appropriate Protective Action Recommendation.

2.3.2 Inform the Emergency Coordinator / Emergency Operations Director of the Protective Action Recommendation selected and the basis (i.e., defaults or abnormal data used and its effects) for the selected Protective Action Recommendation.

2.3.3 As time permits, complete Form EP-0381, Dose Projected PAR, and provide it to the Emergency Coordinator / Emergency Operations Director.

3.0 Protective Action Recommendations

3.1 Determine the appropriate protective actions using the table below and the RP Monitor's recommendations.

Protective Action Recommendations

CONDITION	RECOMMENDED ACTION
NOTIFICATION OF UNUSUAL EVENT or ALERT declared	NONE
SITE AREA EMERGENCY declared	SHELTER within a 2-mile radius
GENERAL EMERGENCY declared OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): 5 REM > TEDE ≥ 1 Rem 25 REM > TODE ≥ 5 Rem	EVACUATION for 2-mile radius and 5 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)
Large fission product inventory (> fuel clad gap activity) has been released to containment OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): TEDE ≥ 5 Rem TODE ≥ 25 Rem OR Imminent containment failure is projected such that a "puff" release > design leak rate will occur in conjunction with substantial core damage or large fission product inventory	EVACUATION for 5-mile radius and 10 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)

Wind from	Affected Sectors	Distance to S.B.	Wind from	Affected Sectors	Distance to S.B.
169-191	R-A-B	0.82 (A)	349-011	H-J-K	1.68 (J)
192-213	A-B-C	0.83 (B)	012-033	J-K-L	1.14 (K)
214-236	B-C-D	1.58 (C)	034-056	K-L-M	0.75 (L)
237-258	C-D-E	1.37 (D)	057-078	L-M-N	0.63 (M)
259-281	D-E-F	1.34 (E)	079-101	L-M-N-P-Q	0.62 (N)
282-303	E-F-G	1.28 (F)	102-123	M-N-P-Q-R	0.63 (P)
304-326	F-G-H	1.31 (G)	124-146	N-P-Q-R-A	0.74 (Q)
327-348	G-H-J	1.88 (H)	147-168	Q-R-A	0.83 (R)

Appendix C - Forms

TABLE OF CONTENTS

1.0 Precautions and limitations

1.1 Forms in this appendix are to be considered "samples." In accordance with 01DP-0AP01, Procedure Process," the user may copy a sample form from the procedure if the copy is legible enough to use.

1.2 Forms in this appendix are available on the PVNGS Local Area Network (LAN), on drive V:, in directory \Eplan\Forms.

2.0 Forms

2.1 Form EP-0010, Logistics Overview (sample)

FORM EP-0010A **PVNGS EMERGENCY PLANNING**

LOGISTICS OVERVIEW

Name: ______________ **Time:** __________ **Date:** __________

A. ERO Shift Schedule *(describe any abnormalities)*:

B. Status of onsite emergency response facilities and equipment:

STSC: ______________
TSC: ______________
OSC: ______________
EOF: ______________

C. Additional manpower / equipment / documentation support needed *(status, problems, etc.)*:

D. American Nuclear Insurers *(ANI)* informed of current status *(if applicable, state comments)*:

E. Additional information *(if applicable)*:

2.2 Form EP-0011, Personnel Shift Staffing, page 1 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

***PERSONNEL SHIFT STAFFING** (Part 1 of 5)*

Complete the checklist below and the attached emergency response facility staffing sheets as necessary to ensure effective transition between shifts. Brief the EOD on staffing requirements, if applicable.

Complete the following items as soon as possible:

____ Staffing established for 2 shifts - EOD briefed as applicable

____ Individual staff members informed of shift assignment and time of shift work hours

____ Emergency response facility staffing boards updated to reflect shift schedules

Complete the following items at shift change:

____ Formal turnover for each position regarding emergency status and duties and responsibilities

____ Staff members briefed on any abnormalities or problems encountered or anticipated

____ Ensure facility managers brief off-going staff on the following items applicable to their facility:

- ____ significant events leading to current plant status
- ____ current emergency classification level
- ____ current Protective Action Recommendation and decisions by the State of AZ
- ____ radiological status
- ____ corrective actions taken thus far
- ____ prognosis on plant status and current state of the emergency

____ On-coming staff assumes duties and responsibilities for their respective positions

____ Shift change occurs

____ Facility managers advised on status of shift change

____ Emergency response facility staffing boards updated to reflect current staff members on shift

2.3 Form EP-0011, Personnel Shift Staffing, page 2 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

SATELLITE TECHNICAL SUPPORT CENTER *(Part 2 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Advisor			
Radiation Protection Monitor ◆			
Shift Technical Advisor ◆			
STSC Communicator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.4 Form EP-0011, Personnel Shift Staffing, page 3 of 5 (sample)

FORM EP-0011 D **PVNGS EMERGENCY PLANNING**

TECHNICAL SUPPORT CENTER *(Part 3 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Onsite Emergency Coordinator ◆			
Administrative Support (two)			
Chemistry Coordinator			
Electrical Engineering ◆			
Emergency Coordinator Technical Asst.			
Emergency Maintenance Coordinator ◆			
Mechanical Engineering ◆			
Operations Coordinator ◆			
Probabilistic Risk Assessment			
Radiation Protection Support Technician			
Radiological Protection Coordinator ◆			
Reactor Analyst ◆			
Safety Analysis Engineer			
Security Director ◆			
Shift Technical Advisor			
Technical Engineering Manager ◆			
USNRC Liaison Operations			
OTHER:			
Facility Advisor			
Plant Status Technician			
Shift Technical Advisor *(additional)*			

◆ - position required for facility activation

2.5 Form EP-0011, Personnel Shift Staffing, page 4 of 5 (sample)

FORM EP-0011c **PVNGS EMERGENCY PLANNING**

OPERATIONS SUPPORT CENTER *(Part 4 of 5)*

POSITION	*DAYS*	*NIGHTS*	*ALTERNATE*
Operations Support Center Coordinator ◆			
Chemistry Technician			
Electrical Maintenance Technician			
Fire Protection / EMT			
Instrumentation and Control Technician			
Mechanical Maintenance Technician			
Radiation Protection Technician ◆			
Radiological Monitoring Technician			
Repairs Coordinator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.6 Form EP-0011, Personnel Shift Staffing, page 5 of 5 (sample)

FORM EP-0011 D PVNGS EMERGENCY PLANNING

EMERGENCY OPERATIONS FACILITY *(Part 5 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Emergency Operations Director ◆			
Administrative and Logistics Coordinator			
Administrative Support (two)			
Dose Assessment Health Physicist ◆			
Government Liaison ◆			
Information Coordinator			
Radiation Protection Support Technician			
Radiological Assessment Communicator			
Radiological Assessment Coordinator ◆			
Security Coordinator ◆			
Shift Technical Advisor			
Systems Engineering			
Technical Analysis Manager ◆			
USNRC Liaison Health Physics			
OTHER:			
Ass't Emergency Operations Director			
Facility Advisor			
Plant Status Technician			

◆ - position required for facility activation

2.7 Form EP-0012, Emergency Action Log (sample)

FORM EP-0012 — **PVNGS EMERGENCY PLANNING**

EMERGENCY ACTION LOG

Name:	Position:	Facility:	Date:

TIME	ACTION

2.8 Form EP-0013, Duty Contact Register (sample)

FORM EP-0013 PVNGS EMERGENCY PLANNING

DUTY CONTACT REGISTER

INSTRUCTIONS

NOTE: Per 10 CFR 26.20(e), any individual offsite reporting for duty in the TSC and/or EOF shall be questioned on Fitness for Duty and the response(s) shall be recorded.

Complete the following information:

- print the following: individual name / current time / facility where reporting
- record both responses to the following questions in the appropriate blanks:

Question 1: *"Have you abstained from alcohol for the past 5 hours?"*
Question 2: *"Are you fit for duty?"*

Name of Individual	*Time*	*For Facility*	*Response(s) to Questions*
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -

Reviewed by: ______________________ Date: ______________
(Signature)

Reviewer: Review / sign this form and submit it to the EC or EOD when completed. Ensure that the facility leader for each individual reporting for duty is made aware of any individual's condition where alcohol has been consumed.

2.9 Form EP-0021, FAX Cover (sample)

FORM EP-0021A **PVNGS EMERGENCY PLANNING**

ARIZONA PUBLIC SERVICE COMPANY

Palo Verde Nuclear Generating Station

FAX Cover Sheet

TO: ______________________________

PHONE: ______________ | ______________
VOICE FAX

FROM: ______________________________

PHONE: ______________ | ______________
VOICE FAX

PAGES: ______________________________
INCLUDING FAX COVER SHEET

PALO VERDE

Emergency Planning

F_EP0021.DOC 08/01/99 23:00:40

2.10 Form EP-0022, EOF Document Distribution (sample)

FORM EP-0022A **PVNGS EMERGENCY PLANNING**

EOF DOCUMENT DISTRIBUTION

Name: ____________________ **Date:** ____________ **Time:** ____________

Retrieve Form EP-0381 and the MESOREM print report from the RAC / Dose Assessment Health Physicist workstations and proceed to the copy machine. Make the following number of copies:

Form EP-0381: 12
MESOREM print report: 5 *(original may be several pages)*

Return the originals to the RAC / Dose Assessment Health Physicist workstations.

Distribute copies of both documents per the following lists *(some copies must be transmitted via FAX)*:

DOCUMENT	POSITION TITLE	COPIES	
Form EP-0381:	Arizona Radiation Regulatory Agency *(TOC)*	1	
	Emergency Operations Director *(EOF)*	1	
	Government Liaison *(EOF)*	1	
	Radiation Protection Support Technician *(EOF)*	1	
	Radiation Protection Technician *(OSC)*	1	
	Radiological Assessment Communicator *(EOF)*	1	
	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	Radiological Status Board *(EOF)*	1 ★	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	
MESOREM Print Report:	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	

★ replace the old form

2.11 Form EP-0030, Chemistry Status (sample)

FORM EP-0030A PVNGS EMERGENCY PLANNING

CHEMISTRY STATUS

Name:	Date:	Time:
SAMPLE ANALYSES		
Reactor Coolant System	***Containment***	***Secondary***

POST ACCIDENT SAMPLING EVALUATION
RCS:
Containment:
RU-144:
RU-146:

STEAM GENERATOR HYDROGEN BUBBLE	**RECOMMENDATION TO REDUCE STEAM GENERATOR HYDROGEN**
#1 Steam Generator: Y (____ %) N	
#2 Steam Generator: Y (____ %) N	

COUNT ROOM STATUS

OTHER INFORMATION

2.12 Form EP-0051, Chemistry Cart #1 Preparation Checklist (sample)

FORM EP-0051 B **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #1 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This cart preparation can be used for obtaining either liquid or gas samples

MATERIALS	✓
Modified lead brick *(made to contain three 7-ml liquid vials)*	
Modified lead brick *(made to contain three 9.2-cc gas vials)*	
Adjustable pipettes *(with pipette tips)* in ranges to allow for sample distribution and dilutions	
Beaker with de-ionized water *(≥ 50 ml)*	
2 gas-tight *(twist-lock)* 1-cc syringes	
10-ml liquid syringe with a 1½-inch needle	
Plastic paper / plastic bags / parafilm to hold the 7-ml / 9.2-cc gas vial after final dilution and prior to counting	
Labels for chemistry samples	
1-inch thick lead carrying case *(pig)*	
Absorbent paper	
Three 9.2-cc gas vials with septums *(one of them evacuated by 0.1 cc)*	
Three 7-ml liquid vials with screw caps	
Needle-nose pliers	
Parafilm	
Lead bricks *(place one lead brick in front and one behind each of the modified dilution lead bricks)*	
Calculator	
Scissors	

COMMENTS

Prepared by: ______________________ *(Signature)* ____________ *(Date)*

2.13 Form EP-0052, Chemistry Cart #2 Preparation Checklist (sample)

FORM EP-0052A **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #2 PREPARATION CHECKLIST

Name:	Date:	Time:
NOTE: This cart preparation can be used for obtaining either liquid or gas samples as designated		

MATERIALS	
LIQUID:	
1-ml *(B-D)* liquid syringe	
6-inch syringe needle	
2-inch thick lead pig *(fabricated for a 3½-ml glass vial)*	
3½-ml glass vial	
Parafilm	
Temporary syringe disposal cask	
500-ml beaker *(for temporary disposal of used pipette tips, needles, etc.)*	
GAS:	
2 gas-tight *(twist-lock)* 1-cc syringes	
1-inck thick lead syringe carrying case	
Temporary syringe disposal cask	
Remote tools *(two sets may be needed if transporting to an Unaffected Unit)*	
Gas syringe carrying case *(aluminum case to accommodate syringe and handling tool)*	
BOTH - REMOTE TOOLS:	
Syringe handling tool *(two sets may be needed for gas sampling if a gas sample is to be transported to an Unaffected Unit)*	
Syringe locking / unlocking device	

COMMENTS

Prepared by: ______________________ (Signature) ____________ (Date)

2.14 Form EP-0053, Chemistry Cart #3 Preparation Checklist (sample)

FORM EP-0053A **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #3 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This checklist is generally performed by the Radiological Monitoring Technician and can be used for obtaining RMS HI-Range skid samples

MATERIALS	
Sample handling tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Latch handle tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Portable transfer pig	
KEPIC *(if required)*	
Loaded special RMS filter head	
Plastic bags	
Tweezers	
Petri dishes	
RMS keys	

COMMENTS

Prepared by: ______________________ *(Signature)* ______________ *(Date)*

2.15 Form EP-0054, Accident Sample Worksheet (sample)

FORM EP-0054A **PVNGS EMERGENCY PLANNING**

ACCIDENT SAMPLE WORKSHEET

Name: Date: Time:

DOSE DATA			
(AS REQUIRED FOR SAMPLE TYPE)	*CONTACT*	*1-FOOT*	*3-FEET*
Septum Ports			
Syringe			
RMS Skid Working Area			
RMS Sample Chamber *(door open)*			
Top of Unshielded Sample in Pig			
Pig Top			
Pig Side			

SAMPLE DATA LOG

(AS REQUIRED FOR SAMPLE TYPE)

RU-________ Chamber # ________ Sample Volume ____________________ Cubic Feet
(original volume uncorrected for iodine plate-out)

Grab Sample Collection Duration __________ Seconds

Sample Start: Date: __________ Time: __________ Flow: __________ CFM

Sample Stop: Date: __________ Time: __________ Flow: __________ CFM

TEAM DATA

Team Number: ____________________

Team Members: ____________________ ____________________

____________________ ____________________

____________________ ____________________

COMMENTS

____

____

____

____

____

Prepared by: ____________________ ____________________
(Signature) *(Date)*

2.16 Form EP-0055, RMS Skid Collection Time Calculation (sample)

FORM EP-0055A **PVNGS EMERGENCY PLANNING**

RMS SKID COLLECTION TIME CALCULATION

Name:	Date:	Time:

RMS SKID SAMPLE DATA
SAMPLE COLLECTION TIME CALCULATION

Monitor Number: ______________

Monitor Reading *(M)*: ______________ µCi/cc Sample Flow: __________ CFM

Collection Time *(seconds)* Calculation:

$$T_{sec} = \frac{\text{Sample } (\mu Ci)}{(M) \times (R) \times (F) \times (472) \times (0.04)}$$

where:

T_{sec} and Sample µCi are variables - either a specific sample time or a specific sample activity may be entered and the other variable will be calculated. **Always ensure that the final sample activity will be below the 0.25 Ci sample counting limitation.**

M = current µCi/cc monitor indication

R = ratio of I/NG - use a known value from analysis *(if available)* or as below:
(based on UFSAR 6.3.3.6 Source Term for 100% failed fuel)

- 2.20E-02 I/NG for LOCA or Fuel Handling Accident
- 5.70E-04 I/NG for S/G Tube Leak condition

F = current sample flow *(not process)* in CFM

472 = net unit conversion factor: *[(cc/sec) divided by (ft^3/min)]*

0.04 = Iodine plate-out factor

NOTE

Select a collection time that is less than the calculated maximum.
If the calculated maximum is less than 60 seconds, use 60 seconds as the minimum time.

Calculated T value: _______ seconds Selected T value to be used: _______ seconds

Calculated by: ______________________________ Date: __________
(Signature)

Print Name: ______________________________

Reviewed by: ______________________________ Date: __________
(Signature)

2.17 Form EP-0130, Plant Maintenance Status (sample)

FORM EP-0130A **PVNGS EMERGENCY PLANNING**

PLANT MAINTENANCE STATUS

Name:	Date:	Time:

EQUIPMENT STATUS	
Damage	**Repair Effort*(s)***
Electrical:	Repair Team:
Mechanical:	Repair Team:
Instrumentation:	Repair Team:

TOOLS / SPARE PARTS
HAZARDS
Chemical:
Fire:
Medical:
Toxic:
WATER SUPPLY STATUS
Primary Systems:
Secondary Systems:
Spray Pond*(s)*:
MISCELLANEOUS
Radiological Condition*(s)*:
Decontamination:
Support Personnel:
TSC Panel AJ-SDN-UA-001 Status:

2.18 Form EP-0131, In-plant Team Briefing (sample)

FORM EP-0131 A — PVNGS EMERGENCY PLANNING

IN-PLANT TEAM BRIEFING

OSC Coordinator

TEAM IDENTIFICATION	Team Members: (Ldr):
Team Name:	
Plant Location:	
Purpose:	

Radiation Protection

EXPECTED WORK AREA CONDITIONS	
REP Number:	Dose Rates:
Contamination:	Airborne: Respirator: Y N

PROTECTIVE REQUIREMENTS (In addition to those specified on REP)
Dosimetry:
PCs:
Communications Links:

SPECIAL INSTRUCTIONS		
Are Emergency Exposure/KI actions required for any team member?	Y	N
If Y(es), has required documentation been completed?	Y	N
Hold Points:		

Abort Points	Dose Rate:	Dose:	Time:
	Other:		

OSC Coordinator / Radiation Protection

BRIEFING	
Travel Route Summary:	
Personnel Hazards:	
Tools / Equipment:	
Additional Materials:	
Time Briefing Conducted:	Time Team Dispatched:
Conducted by:	Time Team Returned:

DEBRIEF COMMENTS

2.19 Form EP-0231, Draft Information - NUE (sample)

FORM EP-0231 A PVNGS EMERGENCY PLANNING

NOTIFICATION OF UNUSUAL EVENT

DRAFT INFORMATION

Wintersburg, AZ -- A Notification of Unusual Event was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Injuries - describe and indicate if contaminated**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material.

2.20 Form EP-0232, Draft Information - Alert (sample)

FORM EP-0232A PVNGS EMERGENCY PLANNING

ALERT

DRAFT INFORMATION

Wintersburg, AZ -- An Alert was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material *(if applicable)*.

2.21 Form EP-0233, Draft Information - SAE (sample)

FORM EP-0233A **PVNGS EMERGENCY PLANNING**

SITE AREA EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A Site Area Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.22 Form EP-0234, Draft Information - GE (sample)

FORM EP-0234A **PVNGS EMERGENCY PLANNING**

GENERAL EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ – A General Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.23 Form EP-0235, Site-Wide Announcement Worksheet (sample)

FORM EP-0235A **PVNGS EMERGENCY PLANNING**

SITE-WIDE ANNOUNCEMENT WORKSHEET

Name:	Facility:	Date:	Time:

INSTRUCTIONS

Complete the relevant blanks with a summary of information and perform a Site-Wide Announcement. Strike out any portions not applicable to the event.

Attention all plant personnel – Attention all plant personnel.

On ______ (*date*) **at** ______ (*time*), **a(n)** ______________ (*emergency classification*) **was declared in Unit** ______ (*Unit*) **due to** ______________ (*reason (see applicable EAL Status Codes)*).

Corrective actions applied have been ______________ (*summary of corrective actions*)

______________.

The current plant status is ______________ (*information summary*).

A radiological release __is__ __is not__ **in progress at this time.**

The wind is currently __from__ **the** ______ (*direction*) **at** ______ (*speed*) **miles / hour.**

The current Protective Action Recommendation provided to the State of Arizona is:

______________ (*from Emergency Operations Director or designee*).

Personnel injuries include ______________ (*number and nature of injuries*).

Fire / hazardous chemical status is ______________ (*information summary*).

Personnel Assembly was directed on ______ (*date*) **at** ______ (*time*).

Site Evacuation was directed on ______ (*date*) **at** ______ (*time*).

Specific instructions: ______________ (*information summary*)

______________.

2.24 Form EP-0240, EC Turnover Summary (sample)

FORM EP-0240A **PVNGS EMERGENCY PLANNING**

EC TURNOVER SUMMARY

Onshift EC Name: ______	Date: ______
Onsite EC Name: ______	Time: ______
CURRENT CONDITIONS	
Emergency Classification declared at: ______ *(date)* ______ *(time)* in Unit: ______	
EAL Status Code*(s)*:	
Initiating Event Summary:	
Summary of Plant Status:	
Procedure*(s)* in Use:	
Corrective Action*(s)* Applied:	
CRITICAL SAFETY FUNCTION STATUS	
Safety Function*(s)* Currently Jeopardized:	
PROTECTIVE ACTION RECOMMENDATIONS	
Radiological Release? *(Y/N)*: Describe:	
PAR issued: at: ______ *(date)* ______ *(time)*	
State Protective Action Decision:	
Medical / Fire / etc? *(Y/N)*: Describe:	
OTHER INFORMATION	

2.25 Form EP-0300, Authorization for Dose Beyond 10CFR20 limits (sample)

FORM EP-0300A **PVNGS EMERGENCY PLANNING**

AUTHORIZATION FOR DOSE BEYOND 10CFR20 LIMITS

Name:	Date:	Time:	Unit:

ORIGINATOR

Authorization Requested For:

Individual Name: ______________________

HPID: ________ SSN: ____________ REP Number: ______________

Reason for Request: ______________________________________

DOSE REQUEST

Circle one limit in each column or enter a lower limit in the appropriate box of each column:

DOSE LIMITS	TEDE	TODE and Thyroid CDE	LDE	SDE
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM / year	50 REM * / year	15 REM / year	50 REM / year
EPA Guidance for Protecting Valuable Property	10 REM	100 REM	30 REM	100 REM
EPA Guidance for Life-Saving or Protection of Large Populations	≤ 25 REM	≤ 250 REM	≤ 75 REM	≤ 250 REM
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM	> 250 REM	> 75 REM	> 250 REM

* Sum of Deep Dose Equivalent and Committed Dose Equivalent *(DDE + CDE)*. EPA does not use TODE *(Total Organ Dose Equivalent)*; EPA uses CDE in this column. PVNGS assesses TODE and, via Emergency Exposure and KI guidelines and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

AUTHORIZATION AND APPROVAL

NOTE: **For dose authorizations > 25 REM, a risk discussion is required per 16IG-0EP051, Emergency Exposures and KI, Section 6, Team Briefing and Deployment, if time permits**

I have received NO previous life-saving exposure: ______________ *(radiation worker signature)* ________ *(date)*

If authorized dose > 25 REM, my assignment is voluntary and I have received a risk discussion briefing: ______________ *(radiation worker signature)* ________ *(date)*

I have reviewed my dose records. I am aware that, although dose received under this authorization is beyond 10 CFR 20 limits during the emergency, the dose received will be added to my dose records and subject to 10 CFR 20: ______________ *(radiation worker signature)* ________ *(date)*

Radiation Protection Monitor / Radiological Protection Coordinator: ______________ *(RPM / RPC signature)* ________ *(date)*

Authorized for dose requested as stated above: ______________ *(Emergency Coordinator signature)* ________ *(date)*

DOSIMETRY RECORD UPDATE

Dosimetry record update performed by:

______________ *(print)* ______________ *(signature)* ________ *(date)* ________ *(system)*

2.26 Form EP-0301, TLD Distribution (sample)

FORM EP-0301A   PVNGS EMERGENCY PLANNING

TLD DISTRIBUTION

Monitor Name:	***Date:***
Location:	

Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		

2.27 Form EP-0330, Plant Status Overview (sample)

FORM EP-0330 B

PVNGS EMERGENCY PLANNING

PLANT STATUS OVERVIEW

TIME: DATE: EMERGENCY CLASS: PALO VERDE UNIT: Mw CE POWER:

REACTOR

POWER LEVEL: TREND
%
CORE EXIT TEMP:
°F
HIGHEST INCORE THERMOCOUPLE TEMP:
°F
RX VESSEL WATER LEVEL:
HEAD %
PLNM %
SHUTDOWN (Y/N):
CONTROL RODS IN (Y/N):
COOLING METHOD:
EMERGENCY BORATE (Y/N):
BORON CONC (ppm):

PRIMARY COOLANT

RCP AUX. AVAIL. (Y/N)
1A 1B 2A 2B
RCP's RUNNING (Y/N):
1A 1B 2A 2B
LOOP T-COLD (°F):
1A 1B 2A 2B
LOOP T-HOT (°F):
1 2
TEMP SUBCOOL: TREND
°F
PRESSURIZER PRESSURE:
PSIA
PRESSURIZER LEVEL:
%
PRESSURIZER TEMP:
°F
RDT LEVEL: %
LEVEL CONTROL METHOD:
GAS CONC (CC stp/kg):
H^2 N^2 Xe Kr
SPEC ACTIVITY (uCi/ml):
TOTAL: I:

ECCS

SIAS (Y/N):
HPSI PUMPS RUNNING(Y/N):
SIA SIB
HPSI FLOW (GPM):
1A: 1B:
2A: 2B:
HL1: HL2:
CHARGING FLOW:
GPM
LPSI PUMPS:
A: GPM
B: GPM
RWT LEVEL: TREND
%
SIT LEVEL (% WR):
1A 1B
2A 2B

SECONDARY PLANT

STEAM GENERATORS
LEVEL (% WR):
1 2
PRESSURE (PSIA):
1 2
ISOLATED (Y/N):
1 2
MAIN FEED FLOW (LBM/HR):
1 2
AUXILIARY FEEDWATER
RUNNING:
A / B / N
AUX FEED FLOW:
SG1: GPM
SG2: GPM
TOTAL FLOW: TREND
SG1: GPM
SG2: GPM
CST LEVEL: FT
ADVs IN USE (Y/N):
SBCS IN USE (Y/N):

CONTAINMENT

CIAS (Y/N):
CSAS (Y/N):
ISOLATED (Y/N):
PRESSURE: TREND
PSIG
TEMPERATURE:
°F
H^2 CONCENTRATION (%)
A: B:
CONTAINMENT SPRAY:
A: B:
SUMP LEVEL: TREND
A: IN
B: IN
RADIATION:
RU148 mR/HR
RU149 mR/HR
RECOMBINERS (Y/N):
A: B:
AIR COOLERS:
A B C D
SPEC CONC (uCi/ml):
TOTAL: I:

ELECTRICAL

OFFSITE AC (Y/N):
ONSITE POWER (Y/N):
DIESEL GENERATORS:
A: VAC
B: VAC
VITAL BUS STATUS:
PBAS03: VAC
PBBS04: VAC
125 VDC:
PKA PKB
PKC PKD
UPS STATUS:

COMMENTS:

2.28 Form EP-0350, Radiological Status (sample)

FORM EP-0350 A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL STATUS

Date: Time: Accident Unit *(1 / 2 / 3 / common)*:

RELEASE PATH USED FOR PROJECTION

- ☐ Steam Generator Tube Rupture *(1% failed fuel)*
- ☐ Steam Generator Tube Rupture *(100% failed fuel)*
- ☐ LOCA *(1% failed fuel)*
- ☐ LOCA *(100% failed fuel)*
- ☐ Isolated Containment
- ☐ Fuel Handling Accident
- ☐ Waste Gas Decay Tank Accident
- ☐ Unmonitored Release Accident

Emergency initially declared: Time *(hh:mm)*: ________ Date *(mm/dd/yy)*: ________

Is a release currently in progress? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: ________

Release rate *(if known)*: Iodine: ________ µCi/sec Noble Gas: ________ µCi/sec

Simultaneous release? ☐ Yes ☐ No

Expected total release duration *(hh:mm)*: ________ *(default = 02:00)*

Has the reactor been scrammed? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: ________

METEOROLOGICAL DATA

Weather: ☐ Normal ☐ Adverse Wind Speed is ______ *(at 35 feet)* mph from ______ *(at 35 feet)* degrees

Δ-T: ______ Ambient temperature: ______

CURRENT RADIATION MONITORING SYSTEM DATA

RMS Monitor: ________ RMS Monitor Reading: ________ µCi/cc or ________ mrem/hr

Process Flowrate: ________ cfm Iodine Filtration: ________ % *(default = 95%)*

Grab sample analysis: ☐ Complete *(see below)* ☐ Incomplete

MISCELLANEOUS INFORMATION

Isolated Containment *(leakage)*: ☐ 852 cc/sec *(default)* ☐ Other: ________ cc/sec

NOTE: Maximum steam flow *(or 100% open valve position)* will result in a very conservative release projection. Validate the release projection with field team data as soon as practicable.

S/G Tube Rupture: Affected loop Hot Leg temperature *(if steam release from S/G)*: ______ °F

Affected steam line flow rate: ________ lbm/hr *(from ERFDADS or CR)*

S/G level > 97% WR or indication of liquid entrained release? ☐ Yes ☐ No

Fuel Handling Accident: Fuel assembly age *(time since last critical)*: ______ hours *(from Rx Eng or STA)*

Waste Gas Decay Tank: Elapsed time since isolated: ______ hours *(maximum 999 hours)*

GRAB SAMPLE ANALYSES

Sample Number: ________ Sample analysis time *(hh:mm)*: ________

Comments:

Name: ________ *(print)* Position: ________ *(ERO)*

F_EP0350.DOC 08/02/99 00:22:36

2.29 Form EP-0381, Dose Projected PAR (sample)

FORM EP-0381 c PVNGS EMERGENCY PLANNING

DOSE PROJECTED PAR

Date: ____________ Time: ____________

A release at this time is *(circle one)*: in progress not in progress
The release is *(circle one)*: monitored unmonitored N/A
The release is *(circle one)*: filtered unfiltered N/A

The release pathway is *(check all that apply)*:

☐ Containment ☐ Plant Vent ☐ Fuel Building ☐ Steam Line ☐ N/A

☐ Other: ____

RMS Monitor: ____________ RMS Monitor Reading: ____________________

The expected release duration is: ________ hours *(default = 2 hours)*

15 minute average wind speed is ________ *(at 35 feet)* mph from ________ *(at 35 feet)* degrees

MESOREM projected Stability Class is *(circle one)*:
A B C D E F G
A *(unstable)* D *(neutral)* G *(stable)*

MESOREM projected Mixing Depth: ________ meters

MESOREM projected release rates *(µCi/sec)* are:

Iodine: ____________________ Noble Gas: ____________________

Time since scram: ______ Hrs ______ Min *(from STA)* Release in progress: ______ Hrs ______ Min *(from STA)*

The plume centerline projected dose *(in mrem)* based on a ______ - hour release is:

Distance	Sector(s)	TEDE	Thyroid CDE	TODE
SB	______	______	______	______
2 miles	______	______	______	______
5 miles	______	______	______	______
10 miles	______	______	______	______

NOTE: As a minimum, enter data for the Site Boundary (SB) fields.

PAR: ____

2.30 Form EP-0481, Air Sample Data (sample)

FORM EP-0481 B **PVNGS EMERGENCY PLANNING**

AIR SAMPLE DATA

Sample Number:	Sample Date:	Sample Time:
Sample Location:		

PARTICULATE

Filter *(net cpm)* X Calculation Constant ★ = Particulate Concentration

__________ X 1.6E-11 = __________ µCi/cc

IODINE *(Label Iodine cartridge for transport to laboratory)*

If frisker is on-scale,
Silver Zeolite *(net cpm)* X Calculation Constant ★ = Iodine Concentration

__________ X 3.2E-11 = __________ µCi/cc

If frisker is off-scale-HI, obtain a closed-window RO-2 contact reading *(mrem/hr)* on the cartridge and multiply the RO-2 reading by the appropriate conversion factor and by 1.0E-06 to obtain a µCi/cc value:

(RO-2 closed-window reading) X (Conversion Factor) X (1.0E-06) = (I^{131} Equiv. Concentration in µCi/cc)

__________ X __________ X 1.0E-06 = __________ µCi/cc

Multiply the I^{131} Equiv. Concentration by 1.3E+06 to obtain the equivalent Thyroid CDE dose rate:

__________ µCi/cc *(previous line)* X 1.3E+06 = __________ REM / hour

Hours Since Reactor Shutdown:	0 - 4	5 - 7	8 - 12	13 - 18	19 - 24	25 - 36	> 36
Conversion Factor:	2	3	4	6	7	10	20

NOBLE GAS *(Label Noble Gas samples for transport to laboratory)*

★ The displayed Calculation Constant is based on an assumed sample volume of 10 cubic feet. For sample volumes other than 10 cubic feet, multiply concentration by 10 and divide by actual sample volume *(cubic feet)*.

2.31 Form EP-0482, Field Team Survey (sample)

FORM EP-0482A PVNGS EMERGENCY PLANNING

FIELD TEAM SURVEY

DATE:

TIME	LOCATION	DOSE RATES *(mrem/hr)*				AIR SAMPLES	
		3 FEET		3 INCHES		*(μCi/cc)*	*(μCi/cc)*
		WO	WC	WO	WC	PART	IODINE

2.32 Form EP-0483, Field Team Plume Sample (sample)

FORM EP-0483 B　　PVNGS EMERGENCY PLANNING

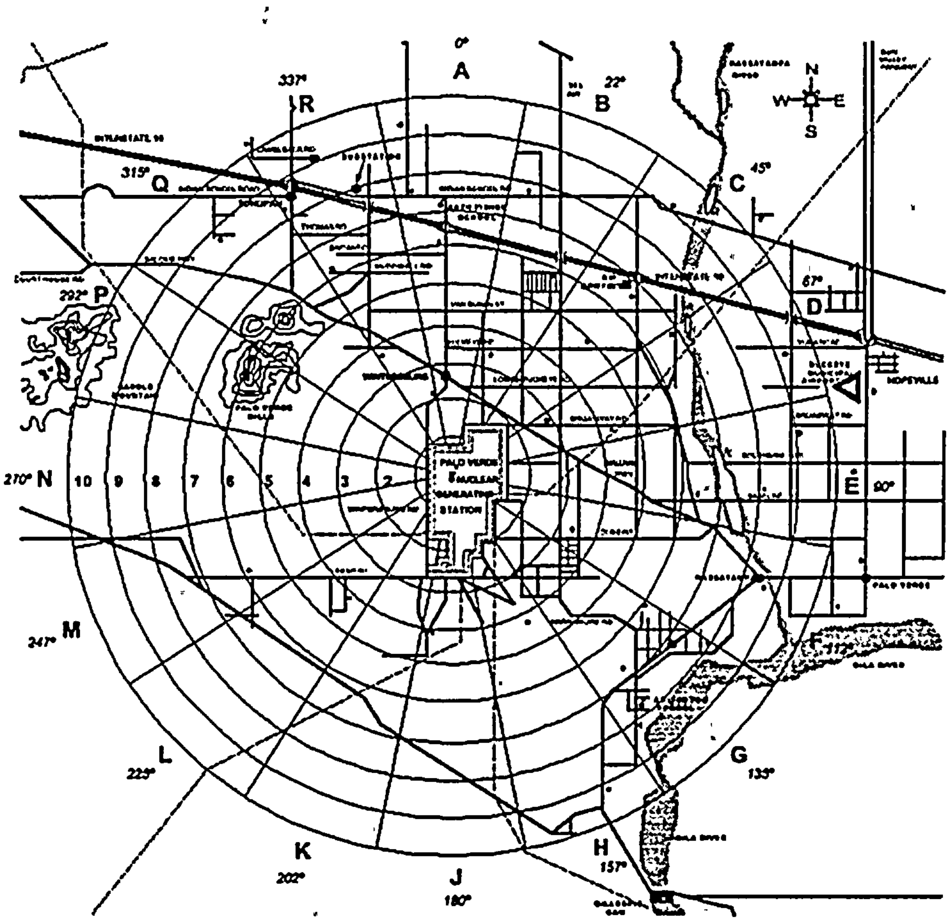
FIELD TEAM PLUME SAMPLE

RFAT NUMBER:	TIME:	
PLUME LOCATIONS		
1. EDGE:		
2. CENTERLINE:		
3. EDGE:		
CENTERLINE SURVEY DATA		
	3 FEET	3 INCHES
OPEN WINDOW *(mrem/hr)* • GROSS UNCORRECTED READING •		
CLOSED WINDOW *(mrem/hr)*		
PARTICULATE CONCENTRATION = ________ µCi/cc		
divided by 3.00E-09 µCi/cc per DAC = ________ DAC		
times 2.5 mrem/hr per DAC = ________ mrem/hr CEDE		
IODINE CONCENTRATION = ________ µCi/cc		
divided by 2.00E-08 µCi/cc per DAC = ________ DAC		
times 25 mrem/hr per DAC = ________ mrem/hr Thyroid CDE		
TEAM EXPOSURE		
NAME:		
EXTERNAL EDE *(mrem)*		
DAC-Hours		
Time in Plume		
(Authorized TEDE X selected External EDE / TEDE ratio = Allowed External EDE mrem)		
OTHER INFORMATION		
NOTE: Information for identified fields represents the minimum to be reported		

2.33 Form EP-0484, Plume Data Map (sample)

FORM EP-0484 A **PVNGS EMERGENCY PLANNING**

PLUME DATA MAP



DATE: __________ TIME: __________ Rx TRIP TIME: __________

START OF RELEASE: __________ *(DATE)* __________ *(TIME)* STABILITY CLASS: __________

WIND: __________ MPH FROM __________

2.34 Form EP-0500, Radiological Protection Summary (sample)

FORM EP-0500A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL PROTECTION SUMMARY

DATE: TIME:

EMERGENCY CLASSIFICATION: **NUE** **ALERT** **SAE** **GE**

Radiological Events Driving Classification:

Radiological Status:

- A release **IS** **IS NOT** in progress at this time from ________________ *(release point)*
- Current wind speed is ________ mph at 35' elevation from ________ degrees at 35' elevation

Corrective Actions Implemented:

PVNGS PROTECTIVE ACTION RECOMMENDATIONS	***GOVERNMENT PROTECTIVE ACTION DECISIONS***

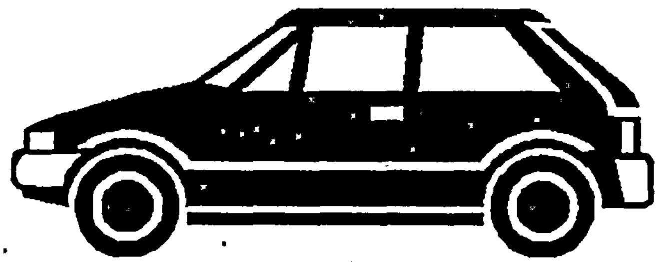
Plant Activities (circle appropriately):

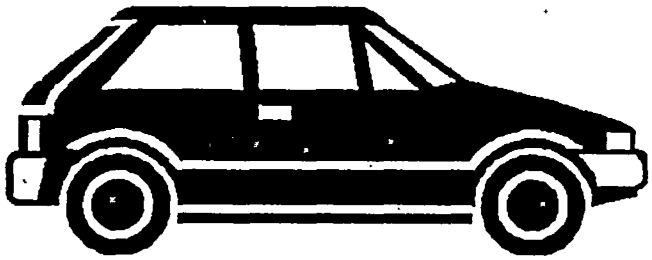
- ASSEMBLY ACCOUNTABILITY EVACUATION
- CONTAMINATED INJURIES LIFE-THREATENING INJURIES
- OTHER:

2.35 Form EP-0501, Vehicle Decontamination (sample)

FORM EP-0501A **PVNGS EMERGENCY PLANNING**

VEHICLE DECONTAMINATION



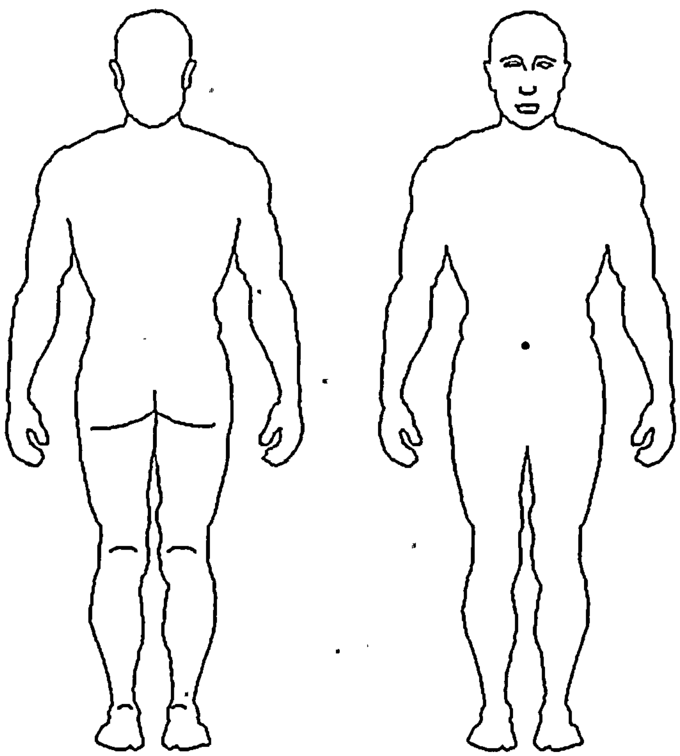


Monitor Name:			Date:	Time:
Vehicle Reg:	Owner:		Address:	
City:	State:	ZIP:	Telephone:	
CONTAMINATION				
Location Outside Vehicle (describe):				
Location Inside Vehicle (describe):				
Location in Engine Compartment (describe):				
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*				
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*				
Vehicle Impounded YES NO	*Item(s) Impounded:*			

2.36 Form EP-0502, Individual Body Decontamination (sample)

FORM EP-0502A PVNGS EMERGENCY PLANNING

INDIVIDUAL BODY DECONTAMINATION



Monitor Name:		Date:	Time:
Patient Name:		Address:	
City:	State:	ZIP:	Telephone:
CONTAMINATION			
Location on Clothing (describe):			
Location on Body (describe):			
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*			
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*			
Item(s) Impounded:			

2.37 Form EP-0503, KI Distribution (sample)

FORM EP-0503A **PVNGS EMERGENCY PLANNING**

KI DISTRIBUTION

Name:	SSN:	Work Group:
Reason For Dispensation:		

DISPENSATION DATA

Date:	Time:	Milligrams:

EC APPROVED *(circle one)*: Y N ______________________
(ADMINISTERING INDIVIDUAL SIGNATURE)

WORKER: I have reviewed the information below, I am aware of the potential health hazards involved with KI usage, and my usage hereunder is voluntary:

____
(SIGNATURE)

Potassium Iodide *(KI)*, a stable Iodine, may be used in the event of a radiological emergency as a blocking agent to prevent the uptake of radioactive iodine by the thyroid gland, which depends upon iodine for the synthesis of thyroid hormones. Iodine is normally supplied to the thyroid gland through dietary intake. However, the thyroid is capable of absorbing and storing only a limited amount of iodine. Excess amounts ingested are eliminated by urination. Therefore, the use of stable iodine will limit thyroid exposure by blocking the uptake of radioiodine by the thyroid, leading to elimination of radioactive iodine from the body.

The use of Potassium Iodide does present some risk to the user in the form of side effects, allergic reactions, or other contraindications. Allergic reactions leading to severe illness may occur for individuals with unusual sensitivity to iodine or those with pre-existing thyroid disease. Such reactions may include enlargement of the thyroid *(possibly leading to respiratory impairment)*, alterations in body metabolism due to increasing or decreasing thyroidal hormone output, and hypersensitive reactions such as fever, pain in joints, and alteration of blood cell counts. These effects are usually associated with iodine doses much higher and administered over a longer duration of time than those allowed to be administered by PVNGS Station procedures. Possible side effects include skin rash, swelling of the salivary glands, and iodism *(metallic taste, burning mouth and throat, sore teeth and gums, head cold symptoms, upset stomach, and possible diarrhea)*. Allergic reactions to low doses are usually limited to angioedema *(swelling or hives)*.

The above represents the extreme. The sensitivity of the average individual to Potassium Iodide at the levels administered is minimal. A good rule is that if no history exists for sensitivity to medication in general nor any for reactions to seafood or shellfish, then there should be no reaction to 130 mg of Potassium Iodide administered as one tablet once per day.

Potassium Iodide may be taken along with other medications prescribed for thyroid problems *(e.g., thyroid hormone, antithyroid medications)*. Pregnant and nursing women, babies, and children may also take this drug. Additional questions may be clarified by reading Appendices B and C of EPA-400, available at Emergency Planning. Although the Food and Drug Administration has endorsed the use of Potassium Iodide, the risks associated with low dosages of Potassium Iodide for thyroid blocking in a radiation emergency may outweigh the risks associated with radioiodine induced thyroid nodules or cancer. For this reason, THE USE OF POTASSIUM IODIDE BY EMERGENCY WORKERS SHALL BE ON A VOLUNTARY BASIS.

Potassium Iodide may only be authorized by the Emergency Coordinator for use by volunteers when the projected Thyroid CDE dose is 25 REM or greater. Emergency workers may be APS or non-APS employees at the facility. Under emergency conditions, volunteer approvals and briefings may be obtained or performed locally and telecommunicated to expedite the response. Follow-up monitoring of all individuals issued Potassium Iodide must be performed in cases where actual exposure to radioactive iodine did occur. This is necessary to maintain the thyroid blocking action by additional Potassium Iodide doses until the iodine activity decays. Follow-up monitoring of all individuals issued Potassium Iodide must also be performed in all cases for possible side effects from the Potassium Iodide.

FOLLOW-UP DATA

Was individual actually exposed to radioactive Iodine? Y N

If Y*(es)*, furnish additional information regarding subsequent KI administration, air sample data, Whole Body count data, and any other information appropriate to determination of actual Thyroid CDE:

Reviewed by: ______________________ Title: ______________________

2.38 Form EP-0511, Core Exit Thermocouple CDA, page 1 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

CORE EXIT THERMOCOUPLE CDA

DATE:	TIME:	UNIT:	CYCLE:
1) MAXIMUM CET TEMPERATURE			
Date of temperature reading:		Maximum CET Temperature:	
Time of temperature reading:		Reactor Vessel Pressure:	
2) FUEL RODS RUPTURED (%)			
Using the Reactor Vessel Pressure *(from above)* and the Maximum CET Temperature *(from above)*, determine the percent of fuel rods ruptured using Core Damage Assessment, Figure 1 *(attached)*. Percent of Fuel Rods Ruptured *(from Figure 1)*: ________			
3) USNRC CATEGORY OF FUEL DAMAGE			
NOTES: The Core Exit Thermocouple methodology yields damage estimates in Categories 1, 2, 3, and 4. The result recorded above is likely a lower limit estimate. The Noteworthy Items from 16IG-0EP031, Core Damage Assessment, Section 1, Introduction, should be read and understood prior to making a determination. Using the percent of fuel rods ruptured, the Clad Damage Characteristics from Core Damage Assessment, and engineering judgment, determine the USNRC Category of Fuel Damage. **USNRC Category of Fuel Damage:** ________			
4) RECORD			
Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.			
5) COMMENTS			

2.39 Form EP-0511, Core Exit Thermocouple CDA, page 2 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

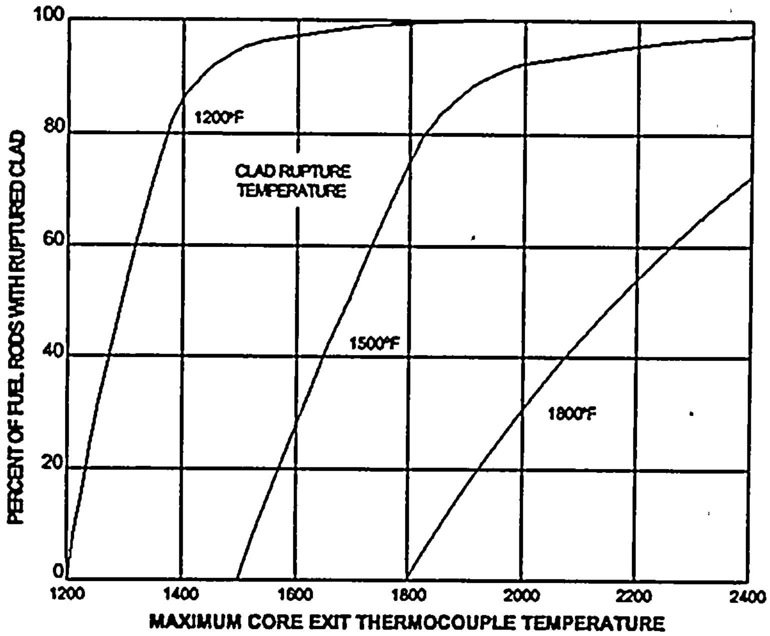
CORE EXIT THERMOCOUPLE CDA

NOTE

Figure taken from Core Damage Assessment, Figure 1

FIGURE 1

PERCENT OF FUEL RODS WITH RUPTURED CLAD vs MAXIMUM CORE EXIT THERMOCOUPLE TEMPERATURE



When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

2.40 Form EP-0512, Containment RMS CDA, page 1 of 3 (sample)

FORM EP-0512 B — PVNGS EMERGENCY PLANNING

CONTAINMENT RMS CDA (Part 1 of 2)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) PLANT POWER CORRECTION

If reactor power has not been steady over the 30 days prior to reactor shutdown, engineering judgment is required to determine the most representative power level to be used.

This judgment should consider the following guidelines:

- The average power during the 30 days is not necessarily the most representative value.
- The power levels at which the reactor last operated should weigh more heavily than earlier power levels.
- Continued operation at one power level should weigh more heavily than brief transient levels.
- In the case in which the reactor has produced power for less than 30 days, the estimate of core damage obtained could under-predict the actual conditions.

Record the prior 30-day power history:

POWER (%)	DURATION *(days)*

Using engineering judgment, determine the most representative power to be used in the power correction factor and record below:

Representative Power: ________ %

100 / Representative Power = Power Correction Factor *(PCF)*

100 / Representative Power = ______ *(PCF)*

3) DOSE RATE CORRECTION

Record the dose rates of each Containment radiation monitor and, using the Power Correction Factor *(PCF)* calculated in Step 2 *(above)*, calculate a corrected dose rate for each radiation monitor.

NOTES: RU Monitors read in REM / hour. In this case, REM / hour is equivalent to RAD / hour.
RU-148 and RU-149 are the Containment Hi-Range monitors located at elevation 140' in Containment.

MONITOR ID	DATE / TIME	HRS SINCE SHUTDOWN	DOSE RATE *(RADS/HR)*	CORRECTED DOSE RATE *(DOSE RATE x PCF)*
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				

2.41 Form EP-0512, Containment RMS CDA, page 2 of 3 (sample)

FORM EP-0512B **PVNGS EMERGENCY PLANNING**

CONTAINMENT RMS CDA (Part 2 of 2)

DATE:	TIME:	UNIT:	CYCLE:

4) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Radiation Monitors methodology yields damage estimates in Categories 2 through 7 only.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using Core Damage Assessment, Figure 2 *(attached)*, the time since reactor shutdown, the corrected dose rates, engineering judgment, and the Dose Rate Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

MONITOR ID	USNRC CATEGORY OF FUEL DAMAGE
RU-148	
RU-149	

5) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

6) COMMENTS

2.42 Form EP-0512, Containment RMS CDA, page 3 of 3 (sample)

FORM EP-0512B **PVNGS EMERGENCY PLANNING**

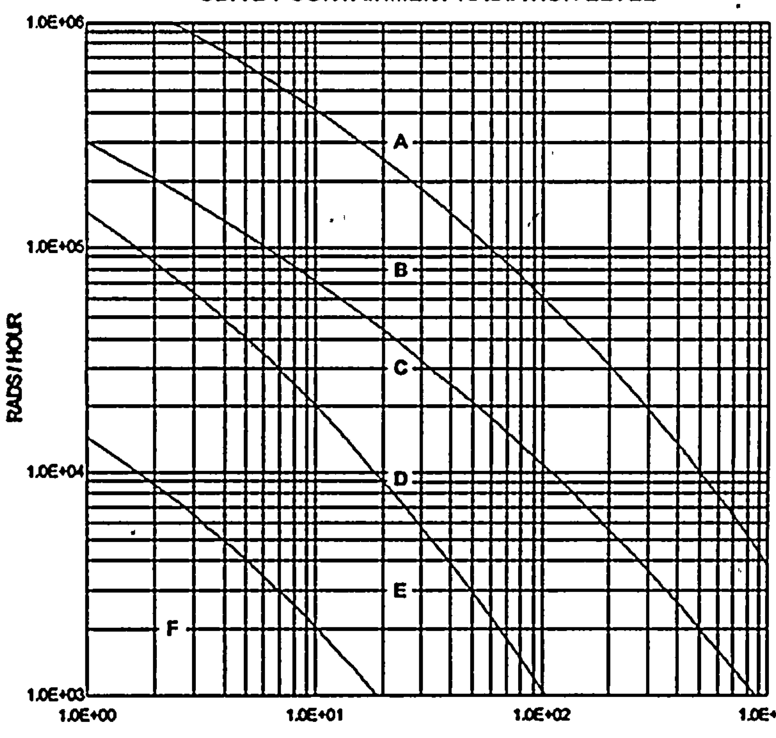
CONTAINMENT RMS CDA

NOTE

Figure taken from Core Damage Assessment, Figure 2

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL



A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

2.43 Form EP-0513, Containment Hydrogen CDA, page 1 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 1 of 5)

DATE:	TIME:	UNIT:	CYCLE:

NOTE: All figures referenced denote those contained in Core Damage Assessment, Figures.

1) CORE UNCOVERING ESTIMATES

INSTRUMENT	ESTIMATED CORE UNCOVERING TIME	ESTIMATED CORE RECOVERY TIME
Reactor Vessel Level Monitoring System	Lower Limit Elevation Uncovers Time: ________	Lower Limit Elevation Recovers Time: ________
Core Exit Thermocouple Temperature	Start of Continuous Rise or Exceed 660°F Time: ________ Temperature: ________	Rapid Temperature Drop to Saturation Time: ________ Temperature: ________
Core Exit Thermocouple Saturation Margin	Start of Superheat *(Use Figure 3)* Time: ________	Return to Saturation or Subcooling Time: ________

2) BEST ESTIMATE

Record the best estimate of core uncovering / recovery times and corresponding system pressure. The pressure recorded for core uncovering will be used in Step 10 in conjunction with Figure 8.

Core Uncovering: Time: ________ Pressure: ________

Core Recovery: Time: ________ Pressure: ________

3) INLET FLOW RATE

Record the approximate vessel inlet flow rates *(GPM)* during the core uncovering heatup period until the time of peak Core Exit Thermocouple *(CET)* temperature is reached.

HPSI Flow Rate: ________ LPSI Flow Rate: ________

Charging Flow Rate: ________ Other Inlet Flows: ________

4) SAMPLES

Obtain an RCS liquid sample and a Containment atmosphere sample *(online H_2 Monitor can be used)* in accordance with 74OP-xSS02 and record the values for the parameters listed below.

NOTE: At least 2 hours is expected between PASS sample request and sample results. It will not be possible to obtain many samples at the same time.

RCS Conditions	Containment Conditions
Sample: Date: ________ Time: ________	Sample: Date: ________ Time: ________
System Pressure: ________ psia	Containment Pressure: ________ psig
Temperature: ________ °F	Temperature: ________ °F
Reactor Vessel Level: ________ %	Hydrogen Concentration: ________ volume %
Pressurizer Level: ________ %	------------------------------------
Hydrogen Concentration: ________ cc/kg @ STP	------------------------------------

2.44 Form EP-0513, Containment Hydrogen CDA, page 2 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 2 of 5)

DATE:	TIME:	UNIT:	CYCLE:

5) HYDROGEN SAMPLE DATA REDUCTION

HYDROGEN MEASURED IN CONTAINMENT

$$\text{Containment Hydrogen}\left(\textit{total SCF}\right) = \frac{H_2}{100} \times 2.6E{+}06 \times \frac{(P_C + 14.7)}{14.7} \times \frac{492}{(T_C + 460)}$$

= _____ X 2.6E+06 X _________ X _________ = ________ SCF

Where:

H_2	=	Hydrogen concentration *(volume %)* as measured on Gas Chromatograph *(from Step 4 or H_2 Monitor)*
100	=	Conversion from percent to decimal fraction
2.6E+06	=	Containment volume in cubic feet
P_C	=	Containment pressure in psig *(from Step 4)*
T_C	=	Containment temperature in °F *(from Step 4)*
460	=	Conversion from °F to °R
492	=	Standard temperature in °R
14.7	=	Standard pressure in psia
SCF	=	Standard Cubic Feet

HYDROGEN MEASURED IN RCS

$$\text{RCS Hydrogen}\left(\textit{total SCF}\right) = [H_2] \times V_{RCS} \times DCF \times 3.531E{-}05 \times 1.0E{-}03$$

= _____ X _____ X _____ X 3.531E-05 X 1.0E-03 = ______ ft³

Where:

H_2	=	Hydrogen concentration in cc/kg @ STP *(from Step 4)*
V_{RCS}	=	RCS volume in cc *(from Figure 4)*
DCF	=	Density Correction Factor in g/cc *(from Figure 5)*
3.531E-05	=	Conversion factor *(ft³/cc)*
1.0E-03	=	Conversion factor *(kg/g)*

TOTAL MEASURED HYDROGEN

Containment Hydrogen + RCS Hydrogen = Total Hydrogen *(SCF)* = __________ SCF

2.45 Form EP-0513, Containment Hydrogen CDA, page 3 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 3 of 5)

DATE:	TIME:	UNIT:	CYCLE:

6) HYDROGEN CORRECTION FOR OXIDATION

The total measured Hydrogen calculated in Step 5 includes Hydrogen generated from the oxidation of materials within Containment, as well as Hydrogen generated from the radiolysis of water. The Hydrogen produced from these two processes will be calculated in Steps 6 and 7 and subtracted from the total Hydrogen calculated in Step 5.

Record the Containment temperature at selected time intervals *(up until the time the Containment sample was obtained)* and calculate the Hydrogen generated by oxidation of materials within Containment using Figure 6.

<u>NOTE</u>: An attempt should be made to select the time intervals such that the change in Containment temperature is not greater than 20°F.

Time at Start of Interval	Interval Duration (hours)	Average Containment Temperature During Interval *(°F)*	H_2 Production Rate *(SCF/hr)* from Figure 6	H_2 Produced *(SCF)* = Interval X Production Rate
Accident Start	--------------	--------------	--------------	--------------

Total Hydrogen Production *(SCF)* ✱ = __________ SCF

✱ The maximum value for PVNGS is 200,271 SCF. If a higher value is obtained from the calculation, enter 200,271 SCF in the space provided.

2.46 Form EP-0513, Containment Hydrogen CDA, page 4 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 4 of 5)

DATE:	TIME:	UNIT:	CYCLE:

7) HYDROGEN CORRECTION FOR RADIOLYSIS

Determine the amount of Hydrogen produced from the radiolysis of water using the following power, decay times, and Figure 7:

Reactor Power at Time of Shutdown *(for constant power conditions)*: ___________

Representative Power *(RP)* - *(from Form EP-0512, Step 2)*: ___________

Estimated MWT = Full Power MWT X RP = 3800 X ___________ = ___________ MWT

Reactor Shutdown Date: ___________ Reactor Shutdown Time: ___________

Sample Date: ___________ Sample Time: ___________

Time from Shutdown to Sample: ___________ hours

Using Figure 7, determine the specific Hydrogen production rate *(SCF/MWT)* by radiolysis for the sample time. Obtain a value from each curve, multiply by the estimated MWT, and record total H_2 produced by radiolysis.

Limit Curve	H_2 Produced *(SCF/MWT)*	Operating Power *(MWT)*	Total H_2 produced *(SCF)*
UPPER:	___________ X	___________ =	___________
LOWER:	___________ X	___________ =	___________

Once obtained, use the results of the radiochemistry damage assessment *(Form EP-0514)* to estimate which results should be used: the Upper Limit for major fuel pellet overheat, the Lower Limit for initial fuel pellet overheat, or the appropriate estimate between the two curves for intermediate fuel overheat.

8) TOTAL HYDROGEN PRODUCED FROM CORE CLAD

Total H_2 Measured *(from Total Measured Hydrogen in Step 5)*: ___________ SCF

H_2 Production from Containment Materials *(from Step 6)*: ___________ SCF

H_2 Production from Radiolysis *(from Step 7)*: ___________ SCF

Total H_2 from Core Clad Oxidation = *(Step 5 - [Step 6 + Step 7])* = ___________ SCF

9) PERCENT OF CLAD OXIDIZED

$$\text{\% Clad Oxidized} = \frac{\text{Total } H_2 \text{ from Clad Oxidation}}{5.65E{+}03 \text{ SCF}} = \frac{\_\_\_\_\_\_\_\_}{5.65E{+}03} = \_\_\_\_\_\_\_\_ \%$$

2.47 Form EP-0513, Containment Hydrogen CDA, page 5 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 5 of 5)

DATE:	TIME:	UNIT:	CYCLE:

10) PERCENT OF RUPTURED FUEL RODS

Using the percent of clad oxidized *(Step 9)*, the pressure during core uncovering *(Step 2)*, and Figure 8, determine the percent of ruptured fuel rods.

Estimated % Ruptured Fuel Rods *(from Figure 8)*: ________ %

11) PERCENT OF EMBRITTLED FUEL RODS

Using the percent of clad oxidized *(Step 9)* and Figure 9, determine the percent of embrittled fuel rods.

Estimated % Embrittled Fuel Rods *(from Figure 9)*:

RANGE: Upper: ________ % Lower: ________ %

12) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Hydrogen methodology yields damage estimates in Categories 3, 4, 5, 6, or 7.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using the estimates of the percent of fuel rods ruptured, the percent of fuel rods embrittled *(damaged)*, and the Clad Damage Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

USNRC Category*(ies)* of Fuel Damage: ________

13) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

14) COMMENTS

____
____
____
____
____
____
____

2.48 Form EP-0514, Containment Radiochemistry CDA, page 1 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 1 of 11)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) SAMPLE LOCATIONS

<u>NOTE</u>: During certain small break LOCA events, it will not be possible for PASS to obtain a sample representative of the Containment sump until after a RAS occurs. This could be 14+ hours after the accident. Refer to Core Damage Assessment, Introduction, Noteworthy Items, for guidance without a Containment sump sample.

Determine the most appropriate sample locations for assessment using Figure 10 in Core Damage Assessment.

3) SAMPLING

Obtain radiochemistry samples and sample results from the appropriate sample locations as determined in Step 2, above.

4) SAMPLE DATA

Record the following data at the time each sample was obtained:

	REACTOR COOLANT SYSTEM	CONTAINMENT ATMOSPHERE	CONTAINMENT SUMP
Sample Date			
Sample Time			
Sample Number			
Pressure *(psig)*	--------------		--------------
Temperature *(°F)*			--------------
RCS Level *(RVLMS)* at Sample Time *(%)*		--------------	--------------
Containment Volume *(cc)*	--------------	7.36E+10	--------------
Containment Water Level *(6-150 inches)*	--------------	--------------	

2.49 Form EP-0514, Containment Radiochemistry CDA, page 2 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 2 of 11)

DATE:	TIME:	UNIT:	CYCLE:

5) RCS VOLUME

Determine the RCS volume at the time of the sample using RVLMS and Figure 4 in Core Damage Assessment, or by using ERFDADS Point ID #SPDS0260.

___ HJTC Uncovered = ___________ cc *(if using Figure 4 and RVLMS)*

SPDS0260 = ___________ gallons X 3.785412E+03 = ___________ cc *(if using SPDS0260)*

6) CONTAINMENT WATER VOLUME

NOTE: If Containment water level is not available, Containment water volume must be estimated from RWT, RCS, and SIT volumetric contributions.

Determine the Containment water volume at the time of the sample using Containment water level *(from Step 4)* and Figure 11 in Core Damage Assessment.

Containment Volume = ___________ cc

2.50 Form EP-0514, Containment Radiochemistry CDA, page 3 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 3 of 11)

DATE:	TIME:	UNIT:	CYCLE:

7) RCS SAMPLE ACTIVITY CORRECTION

Record the activity of the RCS sample and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

RCS Activity = Decay Corrected Activity *(from above)* X ρ X RCS_{VOL} X 1.0E-06

Where:

ρ = Water density correction factor *(see Figure 5 of Core Damage Assessment)*
RCS_{VOL} = RCS water volume *(from Step 5)*
1.0E-06 = Conversion from µCi to Ci

Record ρ and t: ρ = ______________ t = ______________

Date of Reactor Shutdown:	______________	Date of RCS Sample:	______________
Time of Reactor Shutdown:	______________	Time of RCS Sample:	______________

TABLE 1: RCS SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*RCS Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.51 Form EP-0514, Containment Radiochemistry CDA, page 4 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 4 of 11)

DATE:	TIME:	UNIT:	CYCLE:

8) CONTAINMENT SUMP SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Sump sample if obtained and correct the activity for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

Containment Sump Activity = Decay Corrected Activity *(from above)* X Containment Sump Volume X 1.0E-06

Where:

Containment Sump Volume = Containment Sump Volume *(from Step 6)*
1.0E-06 = Conversion from µCi to Ci

Record t: t = ____________

Date of Reactor Shutdown:	____________	Date of Contain. Sump Sample:	____________
Time of Reactor Shutdown:	____________	Time of Contain. Sump Sample:	____________

TABLE 2: CONTAINMENT SUMP SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*Containment Sump Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.52 Form EP-0514, Containment Radiochemistry CDA, page 5 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 5 of 11)

DATE:	TIME:	UNIT:	CYCLE:

9) CONTAINMENT ATMOSPHERE SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Atmosphere sample if obtained and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*

t = Time since reactor shutdown *(seconds)* at time of sample

Containment Atmosphere Activity = Decay Corrected Activity *(from above)* X $[(P_1 + 14.7) / 14.7]$ X $[492 / (T_1 + 460)]$ X (7.36E+10) X 1.0E-06

Where:

P_1 = Containment pressure at time of sample *(psig)*

T_1 = Containment temperature at time of sample *(°F)*

7.36E+10 = Containment atmosphere volume *(cc)*

1.0E-06 = Conversion from µCi to Ci

Record t, P_1, and T_1: t = ________ P_1 = ________ psig T_1 = ________ °F

Date of Reactor Shutdown: ________ Date of Contain. Atmos. Sample: ________

Time of Reactor Shutdown: ________ Time of Contain. Atmos. Sample: ________

TABLE 3: CONTAINMENT ATMOSPHERE SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Specific Sample Activity (µCi/cc)*	*Decay Corrected Specific Activity (µCi/cc)*	*Containment Atmosphere Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{134}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.53 Form EP-0514, Containment Radiochemistry CDA, page 6 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 6 of 11)

DATE:	TIME:	UNIT:	CYCLE:

10) *IODINE / NOBLE GAS RATIOS*

Calculate the following ratios for each Noble Gas and Iodine isotope using the decay corrected specific activities obtained in Steps 7, 8, and 9:

Noble Gas Ratio = Noble Gas Isotope Activity / Xenon ^{133} Activity

Iodine Ratio = Iodine Isotope Activity / Iodine ^{131} Activity

Isotope	*RCS Activity (Ci)*	*RCS Ratio*	*Containment Sump Activity (Ci)*	*Containment Sump Ratio*	*Containment Atmosphere Activity (Ci)*	*Containment Atmosphere Ratio*
Kr^{87}						
Xe^{131m}						
Xe^{133}		1.0		1.0		1.0
I^{131}		1.0		1.0		1.0
I^{132}						
I^{133}						
I^{135}						

11) *SOURCE OF RELEASE*

Determine the source of release by comparing the ratios calculated in Step 10 *(above)* to the predicted ratios provided below:

Isotope	*Activity Ratio in Fuel Pellet Inventory*	*Activity Ratio in Gap Inventory*
Kr^{87}	0.200	< 0.001
Xe^{131m}	0.003	0.001 - 0.003
I^{132}	1.400	0.010 - 0.050
I^{133}	2.000	0.500 - 1.000
I^{135}	1.800	0.100 - 0.500

<u>NOTE</u>: Within the accuracy of included calculations, it is appropriate to select as a source that ratio which is closest to the value obtained in Step 10.

Source of Release: ______________________

2.54 Form EP-0514, Containment Radiochemistry CDA, page 7 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 7 of 11)

DATE:	TIME:	UNIT:	CYCLE:

12) SOURCE INVENTORY

Each isotope has an equilibrium inventory. However, these equilibrium source inventories must be corrected for the plant power history if the reactor has not been operating continually at 100% power.

The isotopes are divided into 2 groups based on their respective half-lives. Group 1 isotopes are to be used if reactor power has not changed by greater than ± 10% in the last 30 days prior to the accident. Group 2 isotopes are used if reactor power has not changed by greater than ± 10% in the last 4 days prior to the accident.

The following equations can be used to determine the Power Correction Factor *(PCF)* for the respective isotopic group if the previously mentioned criteria is satisfied.

Group 1 PCF = Steady State Power Level for the prior 30 Days / 100

Group 2 PCF = Steady State Power Level for the prior 4 Days / 100

If the reactor has not operated at a constant power level prior to shutdown, the following equation is used *(use a 30-day power history)*:

NOTE: Use only the prior 30-day power history for the equation below.

$$PCF = {}_j P_j (1 - e^{-t_j}) e^{-t_i}$$

Where:

P_j = Fraction of rated reactor power in period $_j$

t_j = Duration of period $_j$

t_i = Time from the end of period $_j$ to reactor shutdown *(seconds)*

= Decay constant *(seconds $^{-1}$)*

continues...

2.55 Form EP-0514, Containment Radiochemistry CDA, page 8 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 8 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***12) SOURCE INVENTORY** continued...*

Using the appropriate equation, calculate the Power Correction Factor for each isotope and the corrected source inventory. Record the results in the tables below.

NOTE: The Equilibrium Source Inventories listed below are the maximum peak inventories for a reactor core operating with 5% enriched U^{235} at 3990 MWT. The actual core inventory will most likely be slightly lower than the inventories given.

GAS GAP INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		1.54E+01	
Xe^{131m}	1	6.7E-07		1.09E+05	
Xe^{133}	1	1.5E-06		1.91E+07	
I^{131}	1	9.9E-07		9.84E+06	
I^{132}	2	8.4E-05		1.14E+04	
I^{133}	2	9.3E-06		1.06E+07	
I^{135}	2	2.9E-05		1.76E+06	

FUEL PELLET INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		7.57E+07	
Xe^{131m}	1	6.7E-07		1.20E+06	
Xe^{133}	1	1.5E-06		2.12E+08	
I^{131}	1	9.9E-07		1.07E+08	
I^{132}	2	8.4E-05		1.55E+08	
I^{133}	2	9.3E-06		2.23E+08	
I^{135}	2	2.9E-05		2.09E+08	
Cs^{134}	1	1.1E-08	1.00	2.22E+07	
Rb^{88}	2	6.5E-04		1.08E+08	
Te^{129}	2	1.7E-04		3.34E+07	
Te^{132}	1	2.5E-06		1.52E+08	
Sr^{89}	1	1.6E-07		1.32E+08	
Ba^{140}	1	6.3E-07		1.98E+08	
La^{140}	1	4.8E-06		2.11E+08	
La^{142}	2	1.2E-04		1.87E+08	
Pr^{144}	2	6.7E-04		1.67E+08	

2.56 Form EP-0514, Containment Radiochemistry CDA, page 9 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 9 of 11)

DATE:	TIME:	UNIT:	CYCLE:

13) INVENTORY PERCENT

Calculate the percent of the corrected source inventory present for each isotope and record the results in the tables below.

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF GAS GAP INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			

continues...

2.57 Form EP-0514, Containment Radiochemistry CDA, page 10 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 10 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***13) INVENTORY PERCENT** continued...*

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF FUEL PELLET INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			
Cs^{134}			
Rb^{88}			
Te^{129}			
Te^{132}			
Sr^{89}			
Ba^{140}			
La^{140}			
La^{142}			
Pr^{144}			

2.58 Form EP-0514, Containment Radiochemistry CDA, page 11 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 11 of 11)

DATE:	TIME:	UNIT:	CYCLE:

14) USNRC CATEGORY OF FUEL DAMAGE

NOTES: Engineering judgment is used to compare the previous parameters with the 10 USNRC Categories of Fuel Damage in Core Damage Assessment, Fuel Damage Categories. Core damage is not anticipated to occur uniformly. It is anticipated that the included calculations will yield a combination of 1 or more categories which exist simultaneously.

Samples are likely to have been collected at different times.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Determine the USNRC Category of Fuel Damage using the Radiological Characteristics from Core Damage Assessment, and the following criteria:

1. Identification of the Isotopes which most characterize a given sample *(see Steps 7, 8, and 9).*
2. Identification of the source of the release *(see Step 11).*
3. Percent of source inventory for each isotope present *(see Step 13).*

USNRC Category*(ies)* of Fuel Damage: ____________

15) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

16) COMMENTS

____
____
____
____
____
____
____
____
____
____
____
____

PV216-08N1(6-88)

2.59 Form EP-0541, Palo Verde NAN Emergency Message (sample)

FORM EP-0541 c **PVNGS EMERGENCY PLANNING**

PALO VERDE NAN EMERGENCY MESSAGE FORM

① *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

② This NAN call was initiated at: ____________________ *(time)*

③ This is Palo Verde Nuclear Generating Station Notification of

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY
ALERT GENERAL EMERGENCY

declared in Unit ______ at __________ *(time)* on ______________ *(date)*

PVNGS Emergency Status Code*(s)* ____________________

④ The wind speed is __________ *(35' elev - 15 min avg)* MPH from __________ *(35' elev - 15 min avg)* Degrees

Authenticator Code: ____________________

This is ____________________ *(name)* : STSC Comm Gov't Liaison *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF *(Circle ERO facility)*

⑤ THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors __________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors __________
- ☐ Other ____________________

⑥ *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

____________________ *(EC / EOD Signature)*

____________________ *(Date)* *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-256-1011]			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-223-2000]			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-255-4845]			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-244-0504]			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-273-1411]			
USNRC Headquarters *(STA will call)*	[301-816-5100]	[301-951-0550]			
⑦ GROUP PAGER: *(Read Message)*: "This Is / Is not a drill. This is PVNGS Unit ____ Classification ______________ Please respond appropriately." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager [1611])*	Normal phone *(pager [7600-1611])*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager [1677])*	Normal phone *(pager [7600-1677])*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager [1633])*	Normal phone *(pager [7600-1633])*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	[81-1080] [81-1081] or [9-602-250-1070]			

2.60 Form EP-0542, Followup Emergency Message, page 1 of 2 (sample)

FORM EP-0542A **PVNGS EMERGENCY PLANNING**

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 1 of 2)*

1 *(check one)* ☐ - THIS IS A DRILL ☐ - THIS IS NOT A DRILL

Message Number: ____________ *(ARRA use only)*

THIS IS A PALO VERDE NUCLEAR GENERATING STATION FOLLOW-UP INFORMATION MESSAGE CONCERNING THE *(circle one)*
UNUSUAL EVENT - ALERT - SITE AREA EMERGENCY - GENERAL EMERGENCY declared in Unit ____ at ____________ *(time)* MST on ____________ *(date)*

PVNGS EMERGENCY STATUS CODE*(S)* for Emergency stated above ____________

2 THIS IS ____________ *(name)* ____________ *(ERO title)* at ____________ *(facility)*

3 EMERGENCY stated above was *(check one)*

☐ - UPGRADED to ____________ at ____________ MST on ____________
☐ - CONTINUES
☐ - DOWNGRADED to ____________ at ____________ MST on ____________
☐ - TERMINATED at ____________ MST on ____________

4 PROTECTIVE ACTION RECOMMENDATION*(S)* *(check appropriately)*

☐ - NONE
☐ - NO CHANGE SINCE LAST PAR
☐ - EVACUATE ____________
☐ - SHELTER ____________
☐ - OTHER ____________

If the Emergency was terminated, go to Item 14 after completing Items 1-4 (otherwise, continue to Item 5).
If Items 5-13 have not changed from previous Follow-up transmission, write "NC" by those that apply.

5 EMERGENCY DESCRIPTION / REMARKS

____
____
____
____

6 PVNGS FIELD ACTIVITIES

☐ - RFAT dispatched
☐ - Site Evacuation

7 REACTOR STATUS *(check one)*

☐ - Tripped at ____________ MST on ____________
☐ - Critical at ____ % thermal power
☐ - Shutdown in progress

2.61 Form EP-0542, Followup Emergency Message, page 2 of 2 (sample)

FORM EP-0542A

PVNGS EMERGENCY PLANNING

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 2 of 2)*

Message Number: ____________________
(ARRA use only)

8 GASEOUS RELEASES *(check one)*

☐ - Within Technical Specifications ☐ - Were above Technical Specifications
☐ - Above Technical Specifications ☐ - Potentially above Technical Specifications

Point of Release ____________ Estimated Duration ____________ Started at ________ MST on ________

Last Significant Change at ________ MST on ________ Release stopped at ________ MST on ________

Iodines ________ µCi/sec Noble Gases ________ µCi/sec Iodine / Noble Gas ________ *(ARRA use only)*

Effluent flow rate ________ cfm x 472 = ____________ cc/sec *(ARRA use only)*

9 METEOROLOGICAL DATA

Wind is from ________ *(35' elev - 15-min avg)* Degrees at ________ *(35" elev - 15-min avg)* MPH Stability Class ________ Precipitation *(circle one)* YES NO

10 PLUME ARRIVAL TIME AT *(enter time or "N/A" if not applicable)*

Ruth Fisher School ________ MST Arlington School ________ MST

11 THE FOLLOWING ACTIONS ARE UNDERWAY ____________________

12 WE REQUEST THE FOLLOWING ONSITE SUPPORT / ASSISTANCE FROM OFFSITE SOURCES

____

13 OUR PROGNOSIS IS that conditions ☐ - Are under control
☐ - Can be expected to terminate within ________ hours
☐ - Are worsening

14 *(check one)*

☐ - THIS IS A DRILL
☐ - THIS IS NOT A DRILL

APPROVAL:

____
Emergency Coordinator (EC)
-- or --
Emergency Operations Director (EOD)

____
Date *Time*

PV216-09M (8-88)

PV216-08NI (6-88)

2.62 Form EP-0543, Emergency Termination Message (sample)

FORM EP-0543 D **PVNGS EMERGENCY PLANNING**

EMERGENCY TERMINATION MESSAGE FORM

① *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

② This NAN call was initiated at: ____________________
(time)

③ This is Palo Verde Nuclear Generating Station. The...

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY
ALERT GENERAL EMERGENCY

declared in Unit ______ at ____________ on ______________
(time) *(date)*

has been terminated at ____________ on ______________
(time) *(date)*

④ The wind speed is ____________ MPH from ____________ Degrees
(35' elev - 15 min avg) *(35' elev - 15 min avg)*

Authenticator Code: ____________________

This is ____________________ : STSC Comm Gov't Liaison
(name) *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF
(Circle ERO facility)

⑤ THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ____________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ____________
- ☐ Other ____________________

⑥ *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

____
(EC / EOD Signature)

____
(Date) *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-256-1011			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-223-2000			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-255-4845			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-244-0504			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-273-1411			
USNRC Headquarters *(STA will call)*	301-816-5100	301-951-0550			
⑦ GROUP PAGER: *(Read Message)*: "This Is / Is not a drill. This is PVNGS - the event has been terminated." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager 1611)*	Normal phone *(pager 7600-1611)*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager 1677)*	Normal phone *(pager 7600-1677)*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager 1633)*	Normal phone *(pager 7600-1633)*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	81-1080 / 81-1081 or 9-602-250-1070			

2.63 Form EP-0560, Site Security Status (sample)

FORM EP-0560A **PVNGS EMERGENCY PLANNING**

SITE SECURITY STATUS

Name:	Date:	Time:

ACCESS CONTROL	
Site	**Protected Area**
Vehicle Traffic:	Personnel Traffic:
Areas to Avoid:	Areas to Avoid:

IMPACTS TO SECURITY

OFFSITE ASSISTANCE		
Notified	**E T A**	**Onsite**

TECHNICAL SUPPORT CENTER SECURITY

MISCELLANEOUS
Suspension of Safeguards:
Unaccounted Individuals:
Transportation:
Security Personnel Status:

2.64 Form EP-0561, Individual Accountability (sample)

FORM EP-0561 **PVNGS EMERGENCY PLANNING**

INDIVIDUAL ACCOUNTABILITY

Assembly Area:		Date:	Time:
Department / Group:			Unit:
NAME	***ACAD NUMBER***	***NAME***	***ACAD NUMBER***

NOTE: Contact Security Supervision or FAX this completed form with Accountability results for this Assembly Area to the CAS

2.65 Form EP-0570, RMS Overview, page 1 of 3 (sample)

FORM EP-0570 A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 1 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-01	CH-1	Particulate	µCi / cc	Containment airborne - Isolates on SIAS / CIAS - Required for leak detection - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
	CH-3	Noble Gas	µCi / cc	Required for leak detection - Indicates actual concentration
RU-02	CH-1	Liquid	µCi / ml	Train-A Essential Cooling Water monitor
RU-03	CH-1	Liquid	µCi / ml	Train-B Essential Cooling Water monitor
RU-04	CH-1	Liquid	µCi / ml	S/G-1 blowdown monitor
RU-05	CH-1	Liquid	µCi / ml	S/G-2 blowdown monitor
RU-06	CH-1	Liquid	µCi / ml	Nuclear Cooling Water monitor
RU-07	CH-1	Liquid	µCi / ml	Auxiliary Steam Condensate monitor - HI Alarm diverts condensate to radwaste storage
RU-08	CH-1	Particulate	µCi / cc	Auxiliary Building airborne - Located downstream of RU-09 and RU-10 - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
RU-09	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 100' elevation and below
RU-10	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 120' elevation and above
RU-12	CH-1	Noble Gas	µCi / cc	Waste Gas Decay Tank release monitor - HI Alarm isolates WGDT release
RU-14	CH-1	Particulate	µCi / cc	Radwaste Building Exhaust - Indicates rate-of-change in accumulated activity
RU-15	CH-1	Noble Gas	µCi / cc	Radwaste Building Exhaust
RU-16	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation personnel hatch
RU-17	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation seal table area - Disconnected under power operation
RU-18	CH-1	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-19	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation - monitors new fuel racks
RU-20	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-21	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-22	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-23	CH-1	Radiation	mrem / hr	Chemistry Laboratory 140' elevation general area
RU-24	CH-1	Radiation	mrem / hr	Central Calibration Facility north of Unit 1
RU-25	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation controlled machine shop
RU-26	CH-1	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area
RU-29	CH-1	Noble Gas	µCi / cc	Train-A Control Room Ventilation Intake monitor - HI Alarm initiates CREFAS
RU-30	CH-1	Noble Gas	µCi / cc	Train-B Control Room Ventilation Intake monitor - HI Alarm initiates CREFAS
RU-31	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation Fuel Pool general area - HI Alarm initiates Train-A FBEVAS which cross-trips CREFAS
RU-33	CH-1	Radiation	mrem / hr	Containment 140' elevation refueling machine general area - Disconnected under power operation
RU-34	CH-1	Noble Gas	µCi / cc	Containment Purge release monitor
RU-37	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-A CPIAS which cross-trips CREFAS
RU-38	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-B CPIAS which cross-trips CREFAS

2.66 Form EP-0570, RMS Overview, page 2 of 3 (sample)

FORM EP-0570 A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 2 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-5x	CH-1	Particulate	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
(51 / 52 / 53)	CH-2	Iodine	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
	CH-3	Noble Gas	µCi / cc	Not normally used
RU-61	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 1 Plant Vent stack
RU-62	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 2 Plant Vent stack
RU-63	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 3 Plant Vent stack
RU-139	CH-1	Radiation	mrem / hr	S/G-1 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-1 Main Steam Line-2 monitor
RU-140	CH-1	Radiation	mrem / hr	S/G-2 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-2 Main Steam Line-2 monitor
RU-141	CH-1	Noble Gas	µCi / cc	Condenser Vacuum Exhaust monitor - HI Alarm lines up condenser exhaust in Thru-Filter Mode
RU-142	CH-1	N^{16}	cpm	S/G-1 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-2	N^{16}	cpm	S/G-1 Main Steam Line-2 monitor for S/G tube leakage at power
	CH-3	N^{16}	cpm	S/G-2 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-4	N^{16}	cpm	S/G-2 Main Steam Line-2 monitor for S/G tube leakage at power
RU-143	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent LO-Range monitor - actual concentration
	CH-2	Particulate	µCi / cc	Auxiliary Building Vent LO-Range monitor - Indicates gross activity only
	CH-3	Iodine	µCi / cc	
RU-144	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Auxiliary Building Vent HI-Range monitor
	CH-3	Rel Humidity	% RH	
	CH-4			Non-existent - Used as filter collection chambers
	CH-5			
RU-145	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust monitor - HI Alarm initiates Train-B FBEVAS which cross-trips CREFAS
RU-146	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Fuel Building Exhaust HI-Range monitor
	CH-3			Non-existent - Used as filter collection chambers
	CH-4			
	CH-5			
RU-148	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation seal table area
RU-149	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation personnel hatch
RU-150	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-A monitor at 80' elevation
RU-151	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-B monitor at 80' elevation
RU-152	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 70' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 70' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west end 40' elevation near RDT Pumps
	CH-4	Radiation	mrem / hr	Auxiliary Building center wall 51' elevation at Containment
RU-153	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 100' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Charging Pumps
	CH-3	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Penetration Room

2.67 Form EP-0570, RMS Overview, page 3 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 3 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-154	CH-1	Radiation	mrem / hr	Auxiliary Building west end 120' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east end 120' elevation by RU-10 monitor
	CH-3	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-155	CH-1	Radiation	mrem / hr	MSSS 86' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 86' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 88' elevation
	CH-4	Radiation	mrem / hr	Auxiliary Building 120' elevation *(Letdown monitor)*
RU-156	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 70' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
RU-157	CH-1	Radiation	mrem / hr	MSSS 100' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 100' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 120' elevation
RU-158	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 120' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building 140' elevation at Containment personnel hatch
	CH-3	Radiation	mrem / hr	Auxiliary Building east penetration 140' elevation by purge lines
	CH-4	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area

2.68 Form EP-0620, Technical Analysis Overview (sample)

FORM EP-0620A **PVNGS EMERGENCY PLANNING**

TECHNICAL ANALYSIS OVERVIEW

DATE:	TIME:
CRITICAL SAFETY FUNCTION STATUS	
Reactivity Control:	
Inventory Control:	
Pressure Control:	
Heat Removal:	
Maintenance of Vital AC:	
Maintenance of Vital DC:	
Containment Isolation:	
Containment Combustible Gas Control:	
Containment Temperature / Pressure Control:	
LOST SAFETY FUNCTION	
Time to boil:	
Time to uncover core:	
Time to core melt:	
Time to Rx vessel failure:	
Time to Containment failure:	
Time to reach 65 psig Containment:	

DOSE PROJECTIONS *(SA)* - HIGH SIDE		**RECOMMENDATION TO REDUCE OFFSITE DOSE CONSEQUENCES**
2-Hour EAB *(Thyroid CDE)*:	REM	
2-Hour EAB *(TEDE)*:	REM	
__-Hour EAB *(Thyroid CDE)*:	REM	
__-Hour EAB *(TEDE)*:	REM	
__-Hour LPZ *(Thyroid CDE)*:	REM	
__-Hour LPZ *(TEDE)*:	REM	

RECOMMENDED OPERATOR ACTION*(S)*
OTHER INFORMATION

2.69 Form EP-0630, Engineering Summary (sample)

FORM EP-0630A PVNGS EMERGENCY PLANNING

ENGINEERING SUMMARY

DATE:	TIME:
CRITICAL SAFETY FUNCTION STATUS	
Reactivity Control:	Inventory Control:
Pressure Control:	Heat Removal:
Maintenance of Vital AC:	Maintenance of Vital DC:
CTMT Isolation:	CTMT Combustible Gas Control:
CTMT Temperature / Pressure Control:	
LOST SAFETY FUNCTION	
Time to boil:	*Time to uncover core:*
Time to core melt:	*Time to Rx vessel failure:*
Time to CTMT failure:	*Time to reach 65 psig CTMT:*

EQUIPMENT OUT OF SERVICE	*FAILURE MODE*	*ESTIMATED RECOVERY TIME*

SYSTEMS STATUS
Heat Sink Systems:
Chemistry:
Electrical:
Mechanical:
Reactor Engineering:
Safety / Risk Assessment:

RESOURCE RECOMMENDATION(S)	
Equipment	**Personnel**

CONTINGENCIES
OTHER INFORMATION

Appendix D - Notification

1.0 Initial notifications

1.1 Noteworthy Items for notifications

1.1.1 The numbers on the colored Authenticator Code envelopes represent the sequence of actual events that have taken place on site during the current calendar year. They do not represent the month of the year. The white Authenticator Code envelopes are used for drills, exercises, and tests only. Use the same Authenticator Code for the entire event. However, if the event terminates after offsite agencies have been notified and then another event takes place, retrieve the next lowest-numbered colored Authenticator Code envelope.

1.1.2 If the event has been terminated prior to commencing notifications, the Emergency Termination Message Form should be used in place of the Palo Verde NAN Emergency Message Form. If the event or Protective Action Recommendation changes during notifications, inform the current contact that the event has changed and discontinue calling the remaining people on the call-out list.

1.1.3 Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, meteorological information required on any of the forms should be entered as "N/A". Ensure that the Emergency Coordinator / Emergency Operations Director is informed and that someone is sent to the Meteorological Tower for the necessary data to provide to the offsite agencies at a later time.

1.1.4 While making upgraded, downgraded, and/or termination notifications, complete the "Date / Time / Initials" columns for those agencies contacted. Certain agencies may not respond on backshifts or weekends. The individual notifying USNRC Headquarters will complete the "USNRC Headquarters" Section of the form.

1.1.5 If contact with the required agencies is not made via the NAN ringdown phones, either the NAN Radio Backup (PVNGS radio), the regular phone, or the cellular telephone must be used. The designated backup for the NAN is the PVNGS radio.

1.1.6 The Group Pager message that is read to Emergency Response Organization personnel should include the emergency classification by name, e.g., Unusual Event, Alert, etc.

1.1.7 All noteworthy items and problems should be recorded on the Action Logsheets.

1.2 Authenticator Codes

1.2.1 For initial notification of the current event, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope. Do not complete step 2 of the form at this time.

1.3 Completing the Emergency Message Form

1.3.1 Complete Steps 1, 4, and 6 of Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

1.3.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

1.4 Checking whether NAN is operational

1.4.1 If the NAN is operational, notify offsite agencies using step 1.5. If the NAN is not operational, notify offsite agencies using step 1.6.

1.5 Offsite notifications using the NAN

1.5.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

1.5.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.5.3 Repeat message once.

1.5.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.5.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.5.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

1.5.7 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.5.8 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

1.5.9 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.5.10 Go to step 1.7 to perform Group Pager notifications.

1.6 Offsite notifications using the NAN Backup

1.6.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

1.6.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

1.6.3 Press the "Mode" button until the display indicates "GOVT AGENCY". The display will alternate between "GOVT AGENCY" and "ID - 710100". [handheld radio - enter "710100" on the keypad]

1.6.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

1.6.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

1.6.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

1.6.7 Record the time in Step 2 of the form.

1.6.8 Key the radio microphone and announce the following message: "ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.6.9 After a 30-second waiting period, repeat the preceding message.

1.6.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.6.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.6.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.6.13 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

1.6.14 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.6.15 Go to step 1.7 to perform Group Pager notifications.

1.7 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

1.7.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

1.7.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

1.7.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

1.7.4 If this offsite notification is the initial notification for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

2.0 Followup agency notifications

As directed, perform the actions associated with followup offsite agency notifications.

NOTE

Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), is to be completed after the initial notifications have been made and as soon as time permits. It should be prepared when information becomes available and transmitted to the Arizona Radiation Regulatory Agency when requested. It does not have to be completed if classification and termination were made with the same notification.

2.1 Complete the Follow-up Emergency Message Form

2.1.1 Complete Steps 1 and 14 from Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms). Complete Step 2.

2.1.2 Instruct the Radiation Protection Monitor / Radiological Assessment Coordinator to complete Steps 8, 9, and 10 of the form.

2.1.3 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 through 7 and 11 through 14 of the form, review the form for accuracy, and sign the form.

2.2 Fax the Follow-up Emergency Message Form

2.2.1 When the Follow-up Emergency Message Form has been requested by the Arizona Radiation Regulatory Agency, get the facsimile (FAX) telephone number to where it should be transmitted. Per the Emergency Coordinator's / Emergency Operations Director's instructions, transmit Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), to the Arizona Radiation Regulatory Agency via fax. When complete, inform the Emergency Coordinator / Emergency Operations Director that the Follow-up Emergency Message Form has been transmitted to the Arizona Radiation Regulatory Agency.

3.0 Emergency termination notifications

As directed, perform the actions associated with offsite agency emergency termination notifications.

NOTE

Notifications to State/County agencies per the Emergency Termination Message Form shall commence within 15 minutes following termination of the emergency declaration.

3.1 Authenticator codes

3.1.1 For initial notification and termination only, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope.

3.2 Completing the Emergency Termination Message Form

3.2.1 Complete Steps 1, 4, and 6 of EP-0543, Emergency Termination Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

3.2.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

3.3 Checking whether NAN is operational

If the NAN is operational, notify offsite agencies using step 3.4. If the NAN is not operational, notify offsite agencies using step 3.5.

3.4 Offsite notifications using the NAN

3.4.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

3.4.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.4.3 Repeat message once.

3.4.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.4.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.4.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.4.7 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

3.4.8 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.4.9 Go to step 3.6 for Group Pager notification.

3.5 Offsite notfications using the NAN Backup

3.5.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

3.5.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

3.5.3 Press the "Mode" button until the display indicates "GOVT AGENCY". (The display will alternate between "GOVT AGENCY" and "ID - 710100".) [handheld radio - enter "710100" on the keypad]

3.5.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

3.5.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

3.5.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

3.5.7 Record the time in Step 2 of the form.

3.5.8 Key the radio microphone and announce the following message:"ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.5.9 After a 30-second waiting period, repeat the preceding message.

3.5.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.5.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.5.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

3.5.13 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.5.14 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

3.5.15 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.5.16 Go to step 3.6 for Group Pager notification.

3.6 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

3.6.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

3.6.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

3.6.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

3.6.4 If this offsite notification is the initial notification and termination for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

Appendix E - ERDS Activation

1.0 For an Alert or higher Emergency Classification, activate the Emergency Response Data System in accordance with the following instructions.

1.1 10 CFR 50.72 states: "The licensee shall activate the Emergency Response Data System (ERDS) as soon as possible, but not later than one hour, after declaring an emergency class of alert, site area emergency, or general emergency. The ERDS may also be activated by the licensee during emergency drills or exercises if the licensee's computer system has the capability to transmit the exercise data." At PVNGS, ERFDADS sends information via ERDS to the USNRC at both the Regional Office and Headquarters on the Federal Telecommunications System (FTS) telephone lines through three dial-up modems (one per Unit). ERDS in all three Units can be active simultaneously.

1.2 If ERFDADS is not functioning, perform the following actions:

1.2.1 Inform the Emergency Coordinator that ERDS cannot be activated.

1.2.2 Notify the USNRC via the FTS-2000 (ENS) telephone and report that ERDS cannot be activated.

1.3 If the current Unit number shown in the top left corner of the display must be changed to transmit data for the applicable Unit, perform the following actions:

1.3.1 With the left mouse button, click on "Top Menu" at the lower left corner of the display.

1.3.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.3.3 When the System Functions Menu - 1 of 2 display appears, click on the "Unit/Server Switch" box.

1.3.4 When the Unit/Server Switch display appears, highlight the desired Unit.

1.3.5 When highlighted, click on the "Apply" button at the top of the display.

1.3.6 The display should read "Unit switched -- PROCEED."

1.3.7 Click on the "OK" button in the box.

1.4 Log into the system.

NOTE

Failing to activate ERDS within 15 minutes following logon will result in automatic logoff and the logon process must be reinitialized prior to ERDS activation.

1.4.1 With the left mouse button, click on "Options" toward the left end of the top menu bar.

1.4.2 When the "Options" pull-down menu appears, click on "Logon".

1.4.3 When the "R*TIME/X Password Entry" box appears, click on the empty rectangle box to place the flashing cursor in the box.

1.4.4 Type STA and click on the "Apply" button in the "R*TIME/X Password Entry" box.

1.4.5 The "Password Entry" box should disappear and logon is complete.

1.5 Activate ERDS.

1.5.1 Following logon into the system, click on "Top Menu" at the lower left corner of the display.

1.5.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.5.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.5.4 When the ERDS Communication Link display appears, highlight the "Activate" box.

1.5.5 When highlighted, click on the "Apply" button at the top of the display.

1.5.6 The "Activate" highlight should disappear and ERDS is activated.

1.6 ERDS status may be monitored as follows.

1.6.1 To display the status of the ERDS communication link, click on "Top Menu" at the lower left corner of the display.

1.6.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.6.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.6.4 When the ERDS Communication Link display appears, ensure that the information displayed indicates appropriate communications status and proper transmission of data.

1.7 Deactivate ERDS upon event termination. ERDS deactivation requires current system logon.

1.7.1 If system logon is required, use step 1.4.

1.7.2 Following system logon, click on "Top Menu" at the lower left corner of the display.

1.7.3 When the Top Menu display appears, click on the "System Function Displays" box.

1.7.4 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.7.5 When the ERDS Communication Link display appears, highlight the "Terminate" box.

1.7.6 When highlighted, click on the "Apply" button at the top of the display.

1.7.7 The "Terminate" highlight should disappear and ERDS is deactivated.

1.8 See Appendix O - ERFDADS operation for a list of data that is transmitted on ERDS.

Appendix F - Dose Projection

1.0 Noteworthy items

1.1 The MESOREM-JR computerized dose assessment program is the primary dose calculation method used for performing dose projections. If the primary method cannot be used at the preferred location, it should be performed at an alternate location and the dose projection results telecommunicated to the preferred location.

1.2 Printers shall not be connected to uninterruptible power supplies dedicated as backup power sources to computers designated for dose projection capability. If a computerized dose projection must be performed using an uninterruptible power supply as the sole power source, calculation results must be transcribed manually from the computer monitor display.

1.3 The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

1.4 The 1% failed fuel scenario should be selected unless plant conditions indicate severe (>10%) fuel clad failure.

1.5 Use of 100% fuel clad failure will project extreme levels of Iodine activity. If this scenario is used, Survey Teams must be made aware of the potential for extreme levels of Iodine activity and of the need to expedite data verification surveys. Since calculated doses are analytic estimates only, the calculations should be validated with field data as soon as possible. If calculated estimates differ considerably from associated field data, Emergency Operations Facility staff should use the "Back-Calculation" function to obtain an adjusted projection and the function should be repeated until a best-fit calculation correlates with the associated field data.

1.6 If the "F1 - Isolated Containment" option is selected from the Accident Menu, the Dose Projection Technical Basis Manual may be referenced for information pertinent to this accident scenario. Accordingly, correlation monitor values for Containment RMS Monitors RU-148 / RU-149 are also provided in the manual for instances when these monitors are inoperable or are not functioning properly.

1.7 Parameter entries must be in accordance with the options given for each, i.e., within a specified range, entered in a specific format, etc. Review each option. In cases where the actual value is less than the lowest range, or greater than the highest range value, enter the minimym or maximum allowable range value. Make a note of the actual value on page 4 of the printout.

1.8 If one projection is continued through a date change, and actual date on a menu screen will not be updated until that screen is exited and then re-entered on the new date. This will not affect the program results.

1.9 If RMS Monitors RU-139/140 are inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release. These default values, based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, will result in the issuance of very conservative Protective Action Recommendations. The Emergency Coordinator or Emergency Operations Director must be informed that values obtained are based on the assumption of 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release. A Survey Team must be dispatched immediately to the Site Boundary to verify the release levels.

1.10 RMS Monitors RU-139 / RU-140 will respond to N16 gamma during steam generator tube leakage at power operation in addition to designed activity monitoring. Use of at-power RU-139 / RU-140 monitor values could result in an extremely conservative dose projection. In this case, it is imperative to obtain a sample and repeat the dose calculation immediately after reactor scram.

1.11 During steam releases from specific plant systems, the possibility exists of the systems to achieve a solid condition. In these instances, any release would most likely become entrained with liquid. If this condition coincides with major steam generator tube failures, the projected Thyroid CDE value should be multiplied by a factor of 100.

1.12 The "F7 - Waste Gas Decay Tank Accident" selection on the Accident Menu is not appropriate for a surge tank or any tank / pathway gaseous release which may contain significant Iodine activity. The "F4 - Loss of Coolant Accident 1%" projection should be selected for any release containing potential Iodine activity (i.e., tank isolated for less than 45 days).

1.13 Unmonitored Release

Typical accident assumptions would indicate that a release is occurring which is not monitored by an RMS monitor, nor would there be any flow rate(s) available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release are a ruptured tank in the Radwaste yard which contained radioactive liquids, an outside fire involving radioactive waste, an accident involving waste shipment on site, an accident in the Radwaste Storage Building, etc. In all of these cases, release rates would typically be relatively low, but the potential would exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a MESOREM projection until actual Site Boundary data becomes available.

1.14 For unmonitored release events, the Survey Teams should be directed to obtain peak dose rate readings at the leading edge of the plume based on the current plume direction. The team(s) should be prepared to follow the leading edge as necessary. They should report current dose rates (closed window) which may be used as External EDE dose rates measured per hour for PAR determinations. The External EDE dose rates should be used, along with the current ERFDADS wind speed, to determine when the leading edge of the plume will reach the Site Boundary and what the dose rates will be at the time of arrival. Decay need not be taken into effect at this time. If Iodine shows any significance, the External EDE dose rate should be multiplied by 2. The net dose determined should be treated as TEDE for PAR purposes and Appendix B - Protective Action Recommendations, should be reviewed using this value to derive a qualified Protective Action Recommendation for the EC / EOD. In most cases, these actions will demonstrate Site Boundary dose to be minimal or zero, due to the low release rate. The team(s) should be instructed to obtain as many air samples as practicable to provide data for follow-up analyses. Appendix R - Dose Projection Technical Bases, provides additional methodologies and information which may be of use in several types of unmonitored scenarios.

2.0 MESOREM, Jr. startup

2.1 Select "MESOREM" from the functional display or select the MESOREM icon.

2.2 At the "PASSWORD" Prompt, type one of the following:

- STSC (for units inside the Protected Area)
- EOF (for the unit in the EOF and for program copies downloaded from the LAN)

2.3 At the "ID" Prompt, type 000000 (six zeroes).

2.4 Review the "Help" item that follows. Press <ENTER> when completed.

2.5 When the "Command Menu" appears, ensure that the "Current Time" field is correct toward the upper right portion of the display. If the time and/or date requires adjustment, select Q to quit and adjust the time and/or date accordingly. When complete, execute the previous steps to this point.

2.6 Re-evaluate the current time and date for accuracy.

2.7 Select <F2> ("Execute Dispersion Model").

NOTE

Selection <F2> ("Execute from Edited Files") on the "Mode-A Menu" display is employed only by Emergency Operations Facility personnel. Further guidance on this function may be obtained from the Dose Projection Technical Bases Manual.

2.8 When the "Mode-A Menu" display appears, select <F1> ("Fast Mode A - Initiate Model from Sequential Screens").

2.9 When the "Accident Menu" display appears, proceed to Section 3.0 of this document.

3.0 MESOREM, Jr. Mode A dose projection

3.1 When the "Accident Menu" appears as represented below, select the appropriate accident type:

3.1.1 F1 - Isolated Containment

3.1.2 F2 - Steam Generator Tube Rupture 1%

3.1.3 F3 - Steam Generator Tube Rupture 100%

3.1.4 F4 - Loss of Coolant Accident 1%

3.1.5 F5 - Loss of Coolant Accident 100%

3.1.6 F6 - Fuel Handling Accident

3.1.7 F7 - Waste Gas Decay Tank Accident

3.2 For the following prompts, enter the appropriate data as indicated:

3.2.1 Time Emergency Declared - enter the time the emergency was declared, as this entry will affect the plume mixing height. For back-calculations, enter the time the original event / release occurred.

3.2.2 Date Emergency Declared - enter the current date. For back-calculations, enter the appropriate date the original calculation was performed.

3.2.3 Adverse Weather or Normal Weather - enter Normal. Enter Adverse when weather / road conditions will delay evacuation times.

3.2.4 Expected Total Release Duration Time - if known, enter the expected duration of the release. If unknown, enter 2 hours initially. If release phase extends beyond 2 hours, enter values high enough to encompass total release phase time.

3.2.5 Has Release Been in Progress - enter Yes. Entering No will invoke the "Time Until Release Begins" Prompt, which allows for a bounding calculation based on degrading conditions and the release projected to begin in the future.

NOTE

The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

3.2.6 Time Release Has Been in Progress - enter the difference between the current time and the time the release began. Ensure that the time entered is less than the time entered for the "Expected Total Release Duration".

3.2.7 Has Reactor Been Scrammed - enter Yes if the source mix is decaying and is not directly attributable to a critical reactor.

3.2.8 Number of Hours and Minutes Since Scram - enter the difference between the current time and the time the source mix began to decay.

3.2.9 When the "Monitor Type Menu" appears, select the appropriate RMS Monitor for the applicable release path.

NOTE

Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, get weather information by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS.

3.2.10 Wind Speed - enter the 15-minute average of the 35-foot elevation wind speed parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 1 mph.)

3.2.11 Wind Direction - enter the 15-minute average of the 35-foot elevation wind direction parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 90º.)

NOTE

The default Delta-T used by the program is +18ºF, which is extremely stable, thus very conservative. Therefore, if ERFDADS meteorological data is unavailable and data has been obtained from the National Weather Service, a more appropriate Stability Class can be derived by selecting a Delta-T from the Alternative Delta-T Chart, as the National Weather Service is not able to provide Delta-T at PVNGS. The Stability Class will display after the Delta-T has been entered.

3.2.12 Delta-T - enter the 15-minute average Delta-T obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 18). If data has been obtained from the National Weather Service, select an appropriate Delta-T using the following Alternative Delta-T Table to derive an appropriate Stability Class

Alternative Delta T		
Wind Speed, mph	Day (light)	Night (dark)
< 4	- 1.6° F	+ 4.0 ° F
4 - 7	- 1.4° F	+ 2.0° F
> 7 - 9	- 1.4° F	+ 1.0° F
> 9 - 13	- 1.0° F	- 1.0° F
> 13	- 1.0° F	- 1.0° F

3.2.13 The calculated mixing depth, presented in units of meters, will display after the Ambient Temperature is entered. The mixing depth correlates to the height at which the plume stops rising and levels out.

3.2.14 Ambient Temperature - enter the 15-minute average Ambient Temperature obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 62.)

3.3 Press <ENTER>.

NOTE

Selection <F1> ("Grab Sample Analysis Complete") on the "Breakdown Menu" display is employed only by Emergency Operations Facility personnel. Use of this function is addressed in the Dose Projection Technical Bases Manual. Selection <F2> ("Grab Sample Analysis Incomplete") assumes a default isotopic mix, with the projection based on RMS Monitor values and process flow rate.

3.4 When the "Breakdown Menu" appears, select <F2> ("Grab Sample Analysis Incomplete").

NOTE

Filter efficiencies for both the Plant Vent and Fuel Building Exhaust are assumed to be 95% when in operation and lined up through filtration. Prior to data entry, the associated system status must be verified. If status cannot be verified or the system associated with the applicable release point is not in operation and lined up through filtration, then filter efficiency is assumed to be 0%. All other release points are assumed to be 0% efficient. RU-148 / RU-149 values obtained from other sources may need to be converted to REM / hour for input into the system.

3.5 At the prompts requiring RMS Monitor data, process flow rate, and filter efficiency, enter the data associated with the applicable release point.

3.6 At the "Do you wish to revise effluent data again?" Prompt, enter Y if a review / correction of data is required or N to continue.

3.7 At the "Would you like an automatic dump to the printer" Prompt, enter Y to perform / print the calculation or N to review / transcribe the calculation results from the computer monitor display.

3.8 When the prompt "Will this be a simultaneous release?" appears, select the most appropriate response based on the following option summary:

3.8.1 Y - returns to the "Accident Menu" to allow for performance of a second projection using the same meteorological data to obtain summed doses. If this option is selected, the dose projection starting with step 2.0 must be performed a second time, after which the prompt "Do you wish to consider other release points?" will display. Select N after all release calculations have been performed. A summation dose report entitled "Simultaneous" will then be spooled to the printer.

3.8.2 N - invokes the "Receptor Display Menu", offering additional options for detailed reviews of the data. (These are generally employed by the Radiological Assessment Coordinator in the Emergency Operations Facility using the Dose Projection Technical Bases Manual).

3.9 When the "Receptor Display Menu" appears, select Q, which invokes the prompt "Do you wish to perform another forecast? [Y/N]." If another projection is required, enter Y and perform another projection from the "Accident Menu" starting with step 2.0. Enter N to continue with the existing projection from the "Command Menu" selections.

3.10 Transfer the printed report to the Radiation Protection Monitor in the Affected Unit STSC or to the Radiological Assessment Coordinator in the EOF as soon as possible. Additional copies of the printed report may be produced and distributed as required.

4.0 MESOREM, Jr. availability

4.1 MESOREM-JR is currently available in each Unit and in the EOF. The EOF MESOREM-JR computers are equipped with uninterruptible power supplies. Additionally, each location has MESOREM-JR available on a backup computer. A laptop computer in the EOF equipment locker is loaded with Windows 95 and Mesorem. This unit is intended to be used should an EOF relocation be necessary. An older laptop computer in the TSC equipment locker is loaded with Mesorem and intended to be available for use in a blackout condition (when normal power may be lost to much of the site). The Diesel Generator powering the TSC will provide power to run the laptop in that worst case situation.

4.2 A copy of the program is also available on PVNGS default Drive V: in Directory \Eplan\Mesorem\ for use by personnel in the Chemistry and Radiation Protection Groups to provide event support as required. However, the MESOREM-JR dose assessment program should not be executed on the LAN, as multi-user support is not possible. The program will run under MS Windows 95, MS Windows 98, or MS Windows NT (Version 4.0 or later) as a local copy. The program can also be executed on a computer running MS-DOS as the operating system.

4.3 To install MESOREM-JR from the LAN onto a local computer, create a directory on the local computer named MESOREM at the root level (i.e., C:\MESOREM). Download all MESOREM files from the LAN into the C:\MESOREM Directory on the local computer (2 MB HDD free space required). Execute the MESOREM.BAT File to start the program. (This action will place the user at the beginning of Section 2.0 in this procedure.) When finished with the program, delete all MESOREM files and the C:\MESOREM Directory from the local computer. Deletion of all MESOREM files on the local computer after use will ensure continuous synchronization of current MESOREM revision copies currently installed on all computers.

Appendix G - Core Damage Assessment

1.0 General Information

NOTE

This document directly supports PVNGS Unit 2 Sale / Leaseback Agreements. Any changes to or cancellation of the assessment methodology incorporated herein shall require review and approval by Arizona Public Service Company Law Department staff prior to implementation.

1.1 The APS employee tasked with performing the instructions within this document shall be current in qualifications and have records on file certifying successful completion of Training Course NGT69, Core Damage Assessment, or its equivalent, prior to performing the instructions within this document.

1.2 The principle method of core damage assessment (CDA) following an accident is based on radiochemistry data. Other plant indications may be available which can improve the estimation of core damage. These include incore temperature indicators, Containment radiation monitors, and the total quantity of Hydrogen released from Zirconium degradation. When possible, these additional indicators should be factored into the assessment.

1.3 PASS does not have the ability to obtain a sample representative of the water in the Containment sump until after a RAS occurs. Core damage estimates made using radiochemistry data during a small-break LOCA, in which a small amount of water is in Containment and a RAS has not yet occurred, shall only be made utilizing the off-gas data obtained from the Containment atmosphere and RCS samples. Once a RAS has occurred and suction has been transferred to the Containment sump, a sample can be obtained from the safety injection line.

1.4 The assessment of core damage obtained by using this document is only an estimate. The techniques employed in these instructions are only accurate in locating core conditions to within one or more of the ten (10) USNRC Fuel Damage Categories

1.5 Severe core damage does not occur uniformly. Damage occurring in regions of the core with higher power densities and along blocked channels will be more extensive than in other regions of the core. Therefore, the identification of a single USNRC Category may not sufficiently describe the actual damage state of the core. The most desired assessment is one made with the most accuracy and not necessarily the most conservatism.

1.6 Under emergency conditions, there can be extreme demands placed on the Chemistry Technician's time and on the sampling system. Conditions may change rapidly, requiring a re-evaluation of sample options and the cancellation of operations in progress to begin others. For this reason, it is important that efficient communications be established between the Shift Technical Advisor or Reactor Analyst, the Chemistry Coordinator, and the Emergency Coordinator.

2.0 Core Exit Thermocouple CDA Information

2.1 The assessment of core damage obtained by this method extends up to the time of clad rupture on most of the fuel rods. This time occurs early in very severe core uncovering accidents. More severe core damage cannot be quantified by the Core Exit Thermocouple (CET) assessment method.

2.2 The maximum CET temperature represents a low limit estimate of steam temperature and the peak core temperature could be up to 500ºF higher.

2.3 The curve in Figure 1 assumes that the fuel has been maintained at its rupture temperature for 10 minutes.

2.4 The CET temperature lags the steam temperature by about 6 minutes. Thus, this method is most appropriate for relatively slow core uncovering with a maximum temperature below the rapid oxidation initiation temperature of 1800ºF. A smooth CET recording and a time of 20 minutes (or longer) until the core uncovers are indicators for a reliable prediction of clad rupture.

2.5 If pressure drops below 100 psia within the first 2 minutes of indication of the accident, a large break is indicated and undetected core heatup will occur. Depending on the rate of refill, the thermocouple temperature may rise rapidly, then quench when the core is recovered. This method may yield very low estimates of clad rupture in these cases.

2.6 If the RCS pressure, at the time of maximum CET readings, is greater than 1650 psia, it could exceed the rod internal gas pressure, depending on burnup. This could cause clad collapse rather than clad ballooning. The clad rupture criteria for such rod collapse are less well defined. However, at temperatures in excess of 1800ºF (where the highest pressure curve on Figure 1 applies), clad failure sufficient to release fission gas is likely and this method can be used to obtain estimates of core damage.

2.7 If a peak CET temperature of 2200ºF is reached, over 50% of the rods have ruptured, regardless of core burnup or system pressure.

3.0 Containment Radiation Monitor (RMS) CDA Information

3.1 This method of core damage assessment relies upon radiation dose rate measurements taken from one or more monitors located inside the Containment Building to determine the total quantity of fission products released from the core. The quantity of fission products present at the location of the monitors may fluctuate rapidly due to transient plant conditions; therefore, multiple measurements within a minimum time frame are recommended. Samples obtained during rapidly changing plant conditions should not be weighed heavily in the assessment of core damage. If RU-148 and RU-149 are both not available for dose rate measurements, equivalent readings can be obtained from the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Assessment Coordinator in the Emergency Operations Facility.

3.2 This method is limited to the upper bounding condition of fission product release from the core due to fuel overheat. Concurrent.with fuel overheat, there may be localized fuel pellet melting. This method does not attempt to identify the extent of any potential fuel melting, since the transport of non-volatile fission products released due to melting is not known.

3.3 This method is limited to the interpretation of the dose rate measurement resulting from a mix of fission products. Thus, this method cannot accurately distinguish between the conditions of fuel cladding failure and fuel overheat when the resulting dose rates are the same. This method does provide an upper limit estimate of the progressive core damage. Concurrent conditions of cladding failure and fuel overheat should be anticipated due to radial distribution of heat generation within the core.

3.4 A number of factors influence the reliability of the measured radiation dose rates upon which this method is based. Reliability is influenced by the ability to obtain representative measurements due to the incomplete mixing of the measured media and equipment limitations. The method relies on analytically determined values of the best estimate dose rates that are anticipated to correspond to the specific categories of core damage. These analytical values are based on assumptions made about the identity and the relative proportions of the fission products released from the core and their transport within Containment.

3.5 Dose rate measurements may have been obtained during transient conditions. Measurements taken during steady-state conditions should weigh more heavily.

3.6 Dose rates significantly above the lower bounds for the category of major fuel pellet overheat may indicate concurrent fuel pellet melting. This method may not be used to estimate the degree of fuel pellet melting.

3.7 Dose rates within the category of fuel overheating may be anticipated to include concurrent fuel cladding failure. This method may not be used to distinguish the relative contributions of the two categories to the total dose rate. The method does provide an estimate of the highest category of damage and assumes 50% of core Iodines are available for release to Containment. This number may be over-estimated, thus resulting in a non-conservative damage assessment.

3.8 Dose rates corresponding to the two categories of major fuel cladding failure and initial fuel overheat are observed to overlap in Figure 2. The evaluation of other plant parameters may be required to distinguish between them. However, concurrent conditions may be anticipated.

3.9 Several assumptions were made in the calculations performed to generate the graph of Figure 2. They include:

3.9.1 The distribution of all airborne radionuclides in the Containment atmosphere is homogeneous.

3.9.2 The dose rates were measured at the Containment top-centerline.

3.9.3 The Containment Spray System has operated for 2 hours and has effected a halogen reduction by a factor of 7.

3.9.4 The gamma flux at the detector was determined by the point kernel method.

4.0 Hydrogen Production CDA Information

4.1 This method of core damage assessment is not a unique indicator of the amount of core clad oxidation, since the Hydrogen in Containment contains a mixture of Hydrogen generated within the core by clad oxidation and also Hydrogen from radiolytic dissociation of water and oxidation of aluminum and zinc.

4.2 This method only provides an estimate of the percentage of rods which have progressed to at least clad rupture or clad embrittlement. It does not attempt to predict the physical configuration of these rods which have progressed beyond local clad fragmentation.

4.3 Depending on the accident conditions, a given total amount of Hydrogen produced by oxidation of the fuel clad can represent varying local amounts and distributions of clad damage. This method biases the damage estimates such that the results represent lower limit estimates of clad damage.

4.4 The basis for this assessment assumes zero inlet flow into the core and also assumes the two-phase level within the core is uniform across the entire core.

4.5 By the time that 0.5% of the core clad has oxidized during boil-off, between 40% and 100% of the rods can be considered to be ruptured, depending on system pressure. Hydrogen measurement serves only as a backup to more sensitive methods of determining clad rupture. If the Hydrogen measurement indicates greater than 20% of the clad has oxidized, then substantial core damage is certain, regardless of the particular reflood scenario. For a given percent of oxidation of the core clad, the lower limit estimate of embrittled clad in the assessment of the percent of embrittled fuel rods is for most scenarios, which presents the least amount of potential structural damage. The actual damage is probably greater.

4.6 When the pressure during core uncovering is less than about 100 psia, a rapid core uncovering by blowdown has probably occurred. Heatup with minimum clad oxidation occurs. The extent of potential clad structural failure by melting may be greater than the upper limit of embrittlement as determined by core clad oxidation.

4.7 If inlet flow exists while the core is uncovering, the rate of uncovering is slower than was assumed for the derived curves of the figures used in this method. For a measured total amount of oxidation, the local percentage of oxidation is probably greater along a shorter length of the upper portions of the fuel.

4.8 This method is not acceptable under conditions where a void exists in the Reactor Coolant System.

5.0 Radiological Analysis CDA Information

5.1 This method relies on samples obtained from multiple locations inside the Containment Building to determine the total quantity of fission products released from the core. The amount of fission products present at each sample location may be changing rapidly due to transient plant conditions. Therefore, an accurate assessment requires that the samples be completed within a minimum time period and obtained under stabilized plant conditions. Samples obtained during rapidly changing plant conditions should not be weighed heavily into the assessment of core damage.

5.2 Samples obtained during the accident at TMI-2 indicate that the amount of Iodine predicted to be released is grossly over-estimated.

5.3 A number of factors influence the reliability of the Chemistry samples upon which this method is based:

5.3.1 Reliability is influenced by the ability to obtain representative samples due to incomplete mixing of the fluids and by equipment limitations.

5.3.2 The accuracy achieved in the radiological analyses are also influenced by a number of factors:

5.3.2.1 The equipment employed in the analysis may be subjected to high levels of radiation exposure over extended periods of time.

5.3.2.2 Technicians are required to exercise considerable caution to minimize the spread of radioactive materials.

5.3.2.3 Samples have the potential of being contaminated by numerous sources and may not be representative.

5.3.2.4 Plate-out, precipitation, and chemical reactions may take place in the long sample lines. Therefore, the results obtained may not be representative of actual plant conditions.

5.3.3 To minimize these effects, multiple samples should be obtained over an extended time period from each location.

6.0 Core Damage Evaluation

6.1 The core damage estimate methods presented are not required to be performed in any given order and all methods may not be appropriate for the given accident scenario. However, it is recommended that as many applicable methods as necessary be used prior to making a final assessment of core damage. The figures in this document will aid in the assessments.

6.2 For core damage assessment using Core Exit Thermocouples, complete Form EP-0511, Core Exit Thermocouple CDA (see Appendix C - Forms).

6.3 For core damage assessment using Containment radiation monitors, complete Form EP-0512, Containment RMS CDA (see Appendix C - Forms).

6.4 For core damage assessment using Hydrogen production, complete Form EP-0513, Containment Hydrogen CDA (see Appendix C - Forms)

6.5 For core damage assessment using radiological analysis, complete Form EP-0514, Containment Radiochemistry CDA (see Appendix C - Forms).

6.6 When all applicable methods for assessing core damage have been completed, make a final assessment utilizing all available information from the four methods of assessment. The final assessment requires sound engineering judgment and knowledge of all biases and assumptions discussed under Personnel Indoctrination in Section 1.0 through 5.0 of this document.

6.7 Using the previously mentioned considerations, evaluate the final assessment of core damage for accuracy.

6.8 Using section 7.0, Fuel Damage Categories, compare the results obtained for the final core damage assessment to the USNRC Categories of Fuel Damage and select the category most accurately matching that derived in the final assessment.

6.9 Report the results obtained from the comparison to the Emergency Coordinator as soon as possible.

7.0 Fuel Damage Categories

7.1 Use the table below for comparisons with the final core damage assessment obtained in steps 6.2 through 6.9.

CATEGORY	FUEL DAMAGE
1	No Fuel Damage
2	Initial Cladding Failure
3	Intermediate Cladding Failure
4	Major Cladding Failure
5	Initial Fuel Pellet Overheating
6	Intermediate Fuel Pellet Overheating
7	Major Fuel Pellet Overheating
8	Fuel Pellet Melt
9	Intermediate Fuel Pellet Melt
10	Major Fuel Pellet Melt

7.2 Clad damage characteristics of fuel damage

CLAD DAMAGE CHARACTERISTICS OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	TEMPERATURE RANGE °F	MECHANISM OF DAMAGE	CHARACTERISTIC MEASUREMENT	MEASUREMENT RANGE	PERCENT OF DAMAGED RODS
1. No Fuel Damage	750	None			< 1
2. Initial Cladding Failure				< 1550°F	< 10
3. Intermediate Cladding Failure	1200-1800	Rupture Due to Pin Overpressure	Maximum Core Exit Thermocouple Reading	< 1700°F	10-50
4. Major Cladding Failure				< 2300°F 1-5% Oxidation	> 50
5. Initial Fuel Pellet Overheating				Core Oxidation 1-5%	< 10
6. Intermediate Fuel Pellet Overheating	1800-3350	Loss of Structure Integrity Due to Fuel Clad Oxidation	Amount of Hydrogen Gas Produced *(Equivalent to % of Core Oxidation)*	5-20%	10-50
7. Major Fuel Pellet Overheating	3450			20-65%	> 50

NOTE: This table is to be used for both the CET and Hydrogen methods of core damage assessment

7.3 Dose rate characteristics of USNRC categories of fuel damage

DOSE RATE CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY	DISTRIBUTION OF FISSION PRODUCTS IN CONTAINMENT
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	< 1%	Airborne
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	< 10%	Airborne
3. Intermediate Cladding Failure		Gas Gap	10-50%	Airborne
4. Major Cladding Failure		Gas Gap	> 50%	Airborne
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	< 10%	Airborne: 100% Noble Gas 25% Halogen Plated Out: 25% Halogen 1% Solids
6. Intermediate Fuel Pellet Overheating		Fuel Pellet	10-50%	
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet	> 50%	

NOTE: This table is to be used for the Containment Radiation Monitor method of core damage assessment

7.4 Radiological characteristics of USNRC categories of fuel damage

RADIOLOGICAL CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	CHARACTERISTIC ISOTOPE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	I^{131}, Cs^{137}, Rb^{88}	< 1%
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	Xe^{131m}, Xe^{133}, I^{133}	< 10%
3. Intermediate Cladding Failure		Gas Gap		10-50%
4. Major Cladding Failure		Gas Gap		> 50%
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	Cs^{134}, Rb^{88}, Te^{129}, Te^{132}	< 10%
6. Intermediate Fuel Pellet Overheating		Fuel Pellet		10-50%
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet		> 50%
8. Fuel Pellet Melt	Escape from Molten Fuel	Fuel Pellet	Ba^{140}, La^{140}, La^{142}, Pr^{144}	< 10%
9. Intermediate Fuel Pellet Melt		Fuel Pellet		10-50%
10. Major Fuel Pellet Melt		Fuel Pellet		> 50%

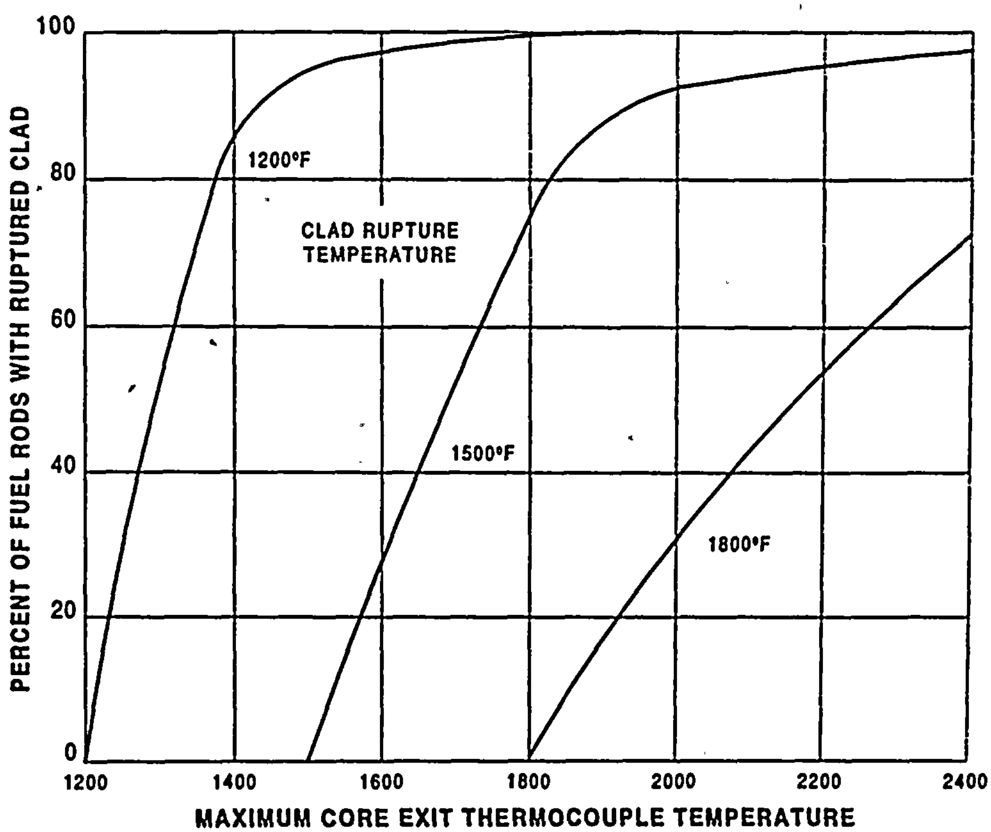
NOTE: This table is to be used for the Radiochemistry method of core damage assessment

8.0 Figures

8.1 Figure 1 - Percent of fuel rods with ruptured clad vs. maximum Core Exit Thermocouple temperature

FIGURE 1

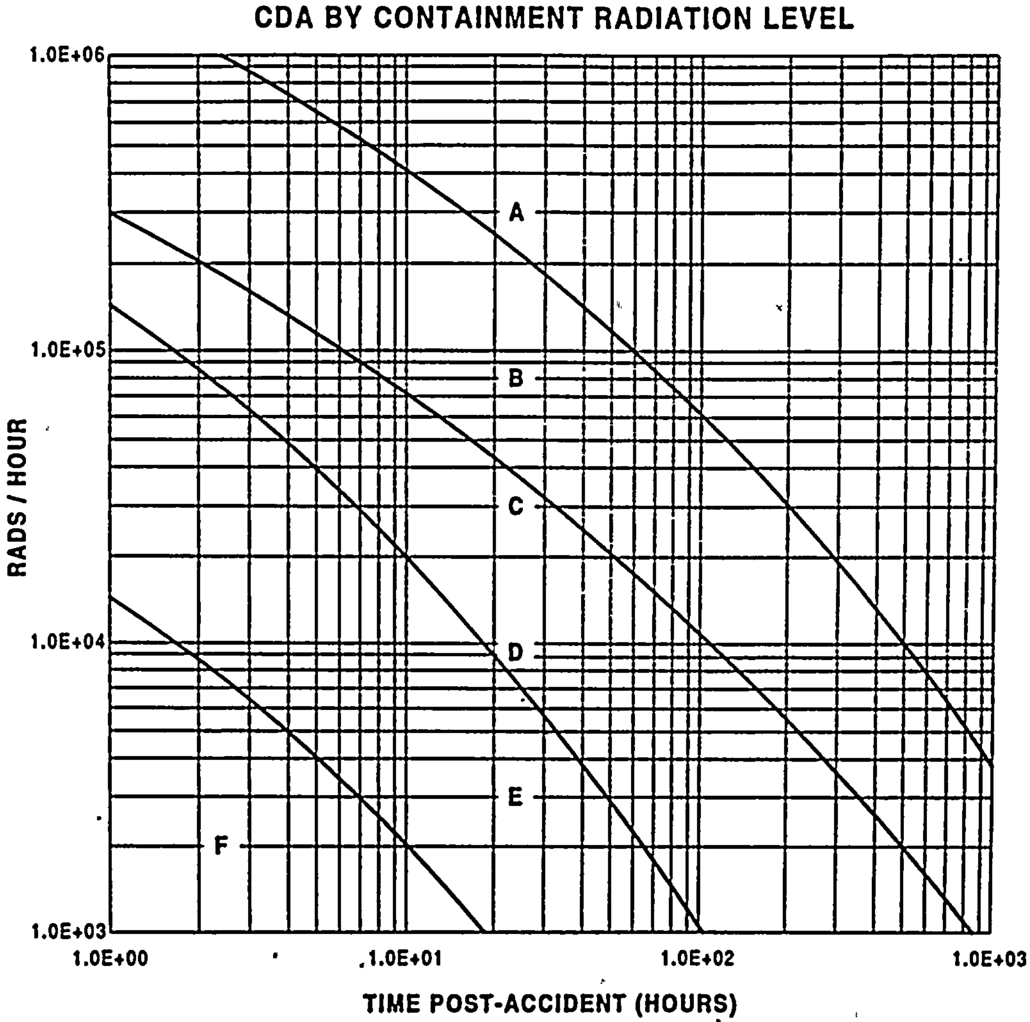
PERCENT OF FUEL RODS WITH RUPTURED CLAD vs MAXIMUM CORE EXIT THERMOCOUPLE TEMPERATURE



When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.2 Figure 2 - CDA by Containment radiation level

FIGURE 2

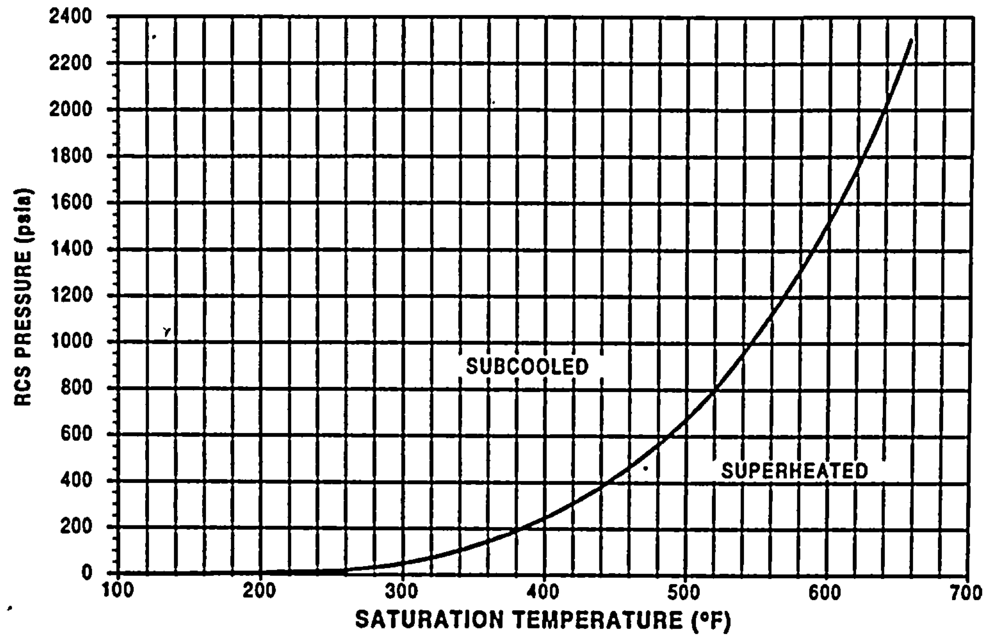


A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

8.3 Figure 3 - Pressure vs saturation temperature

FIGURE 3

PRESSURE vs SATURATION TEMPERATURE



8.4 Table - Pressure vs saturation temperature

PRESSURE vs SATURATION TEMPERATURE

psia	xF	psia	xF	psia	xF	psia	xF	psia	xF	psia	xF	psia	xF
20	228.0	130	347.3	240	397.4	550	476.9	1100	556.3	1650	609.1	2400	662.1
30	250.3	140	353.0	250	401.0	600	486.2	1150	561.8	1700	613.1	2500	668.1
40	267.3	150	358.4	260	404.4	650	494.9	1200	567.2	1750	617.1	2600	673.9
50	281.0	160	363.6	270	407.8	700	503.1	1250	572.4	1800	621.0	2700	679.5
60	292.7	170	368.4	280	411.1	750	510.8	1300	577.4	1850	624.8	2800	685.0
70	302.9	180	373.1	290	414.3	800	518.2	1350	582.3	1900	628.6	2900	690.2
80	312.0	190	377.5	300	417.4	850	525.2	1400	587.1	1950	632.2	3000	695.3
90	320.3	200	381.8	350	431.7	900	532.0	1450	591.7	2000	635.8	3100	700.3
100	327.8	210	385.9	400	444.6	950	538.4	1500	596.2	2100	642.8	3200	705.1
110	334.8	220	389.9	450	456.3	1000	544.6	1550	600.6	2200	649.5	3208	705.5
120	341.3	230	393.7	500	467.0	1050	550.5	1600	604.9	2300	655.9		

8.5 Figure 4 - RCS vessel level vs. volume

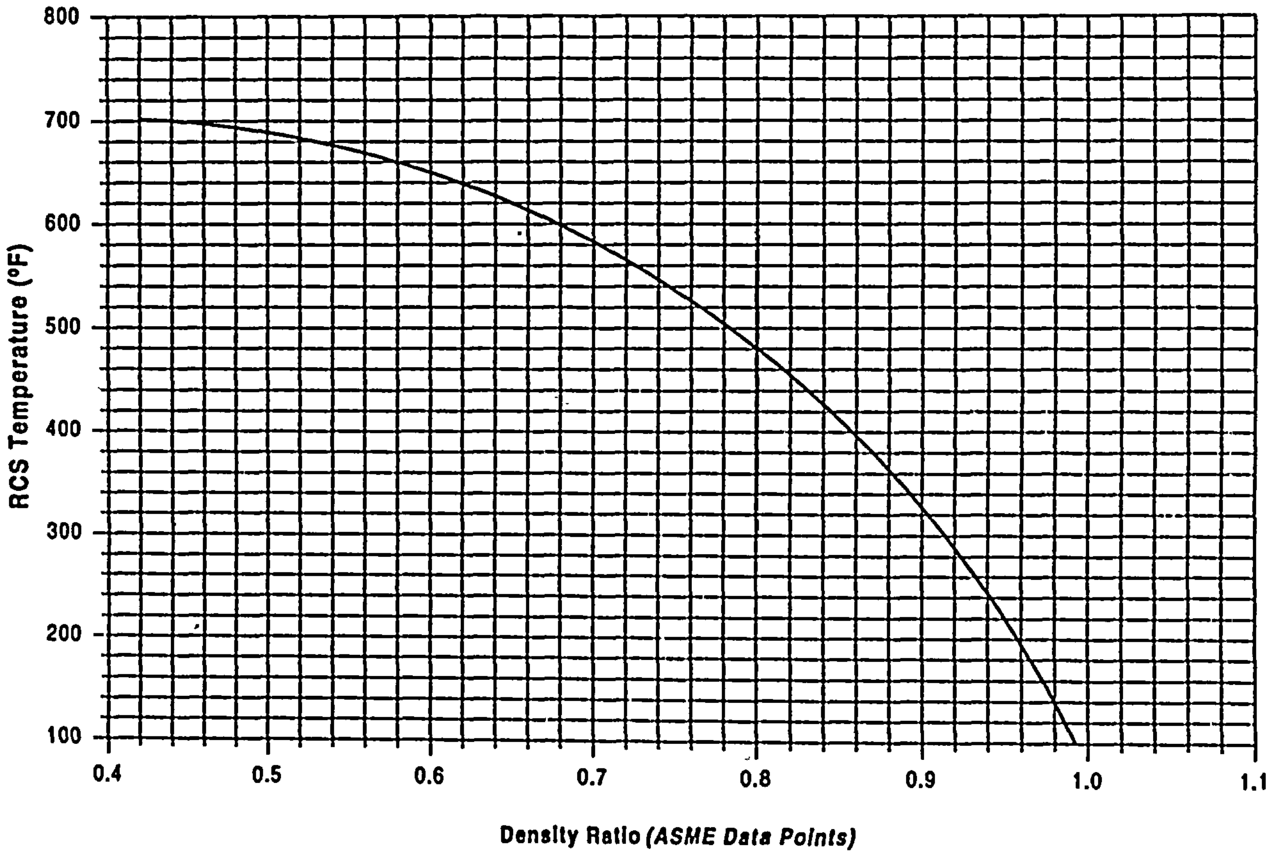
8.5.1 When the RCS is full, the RCS volume = 3.78E+08 cc. To determine the RCS water volume when the RCS is not full, the Reactor Vessel Level Monitoring System (RVLMS) is used. This system includes 8 detectors located at different levels in the reactor vessel. The approximate RCS level can be determined by how many detectors have uncovered. The information below provides the volume to be used at each detector location:

DETECTOR	VOLUME BELOW *(cc)*
HJTC #1	1.51E+08
HJTC #2	1.37E+08
HJTC #3	1.22E+08
HJTC #4	1.08E+08
HJTC #5	1.02E+08
HJTC #6	9.68E+07
HJTC #7	9.12E+07
HJTC #8	8.57E+07

FIGURE 5

8.6 Figure 5 - Density correction factor for reactor coolant temperature

DENSITY CORRECTION FACTOR FOR REACTOR COOLANT TEMPERATURE



8.7 Figure 6 - Hydrogen production rate from aluminum and zinc vs. temperature for PVNGS

FIGURE 6

HYDROGEN PRODUCTION RATE FROM ALUMINUM AND ZINC vs TEMPERATURE FOR PVNGS

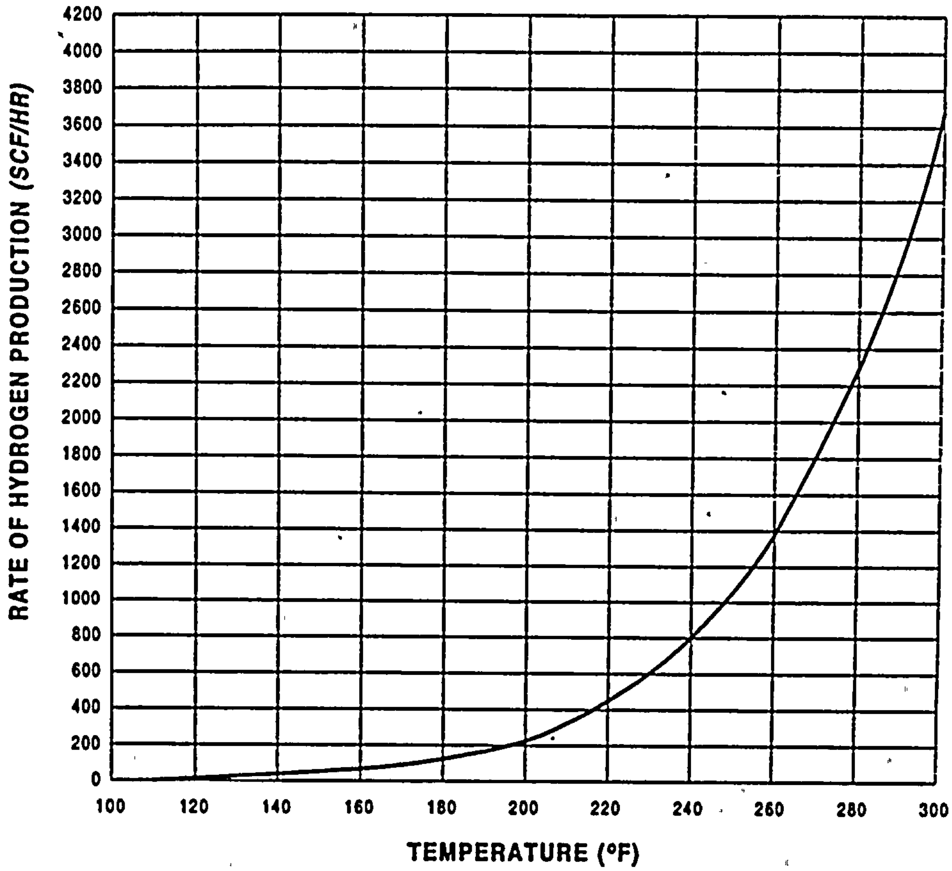
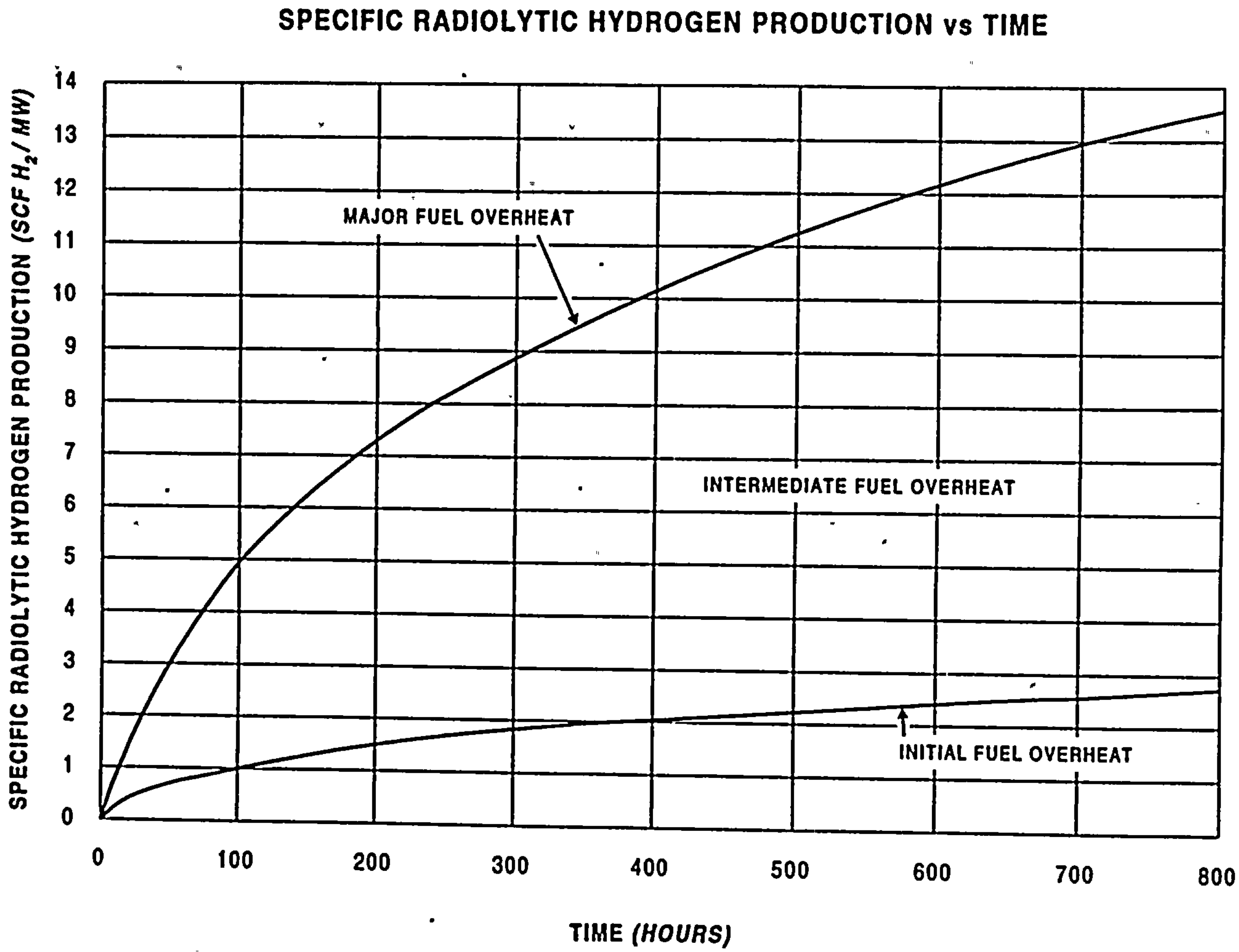


FIGURE 7

8.8 Figure 7 - Specific radiolytic hydrogen production vs. time

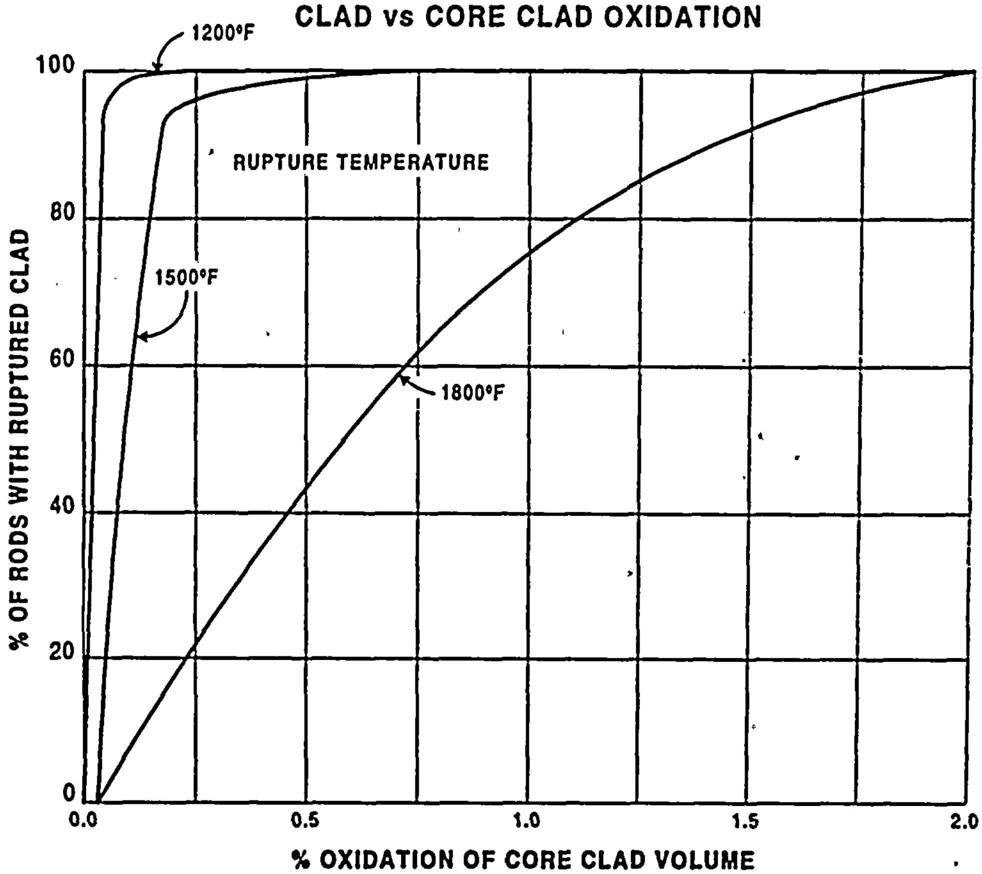


PV218-0694 (8-84)

8.9 Figure 8 - Percent of fuel rods with ruptured clad vs. core clad oxidation

FIGURE 8

PERCENT OF FUEL RODS WITH RUPTURED CLAD vs CORE CLAD OXIDATION

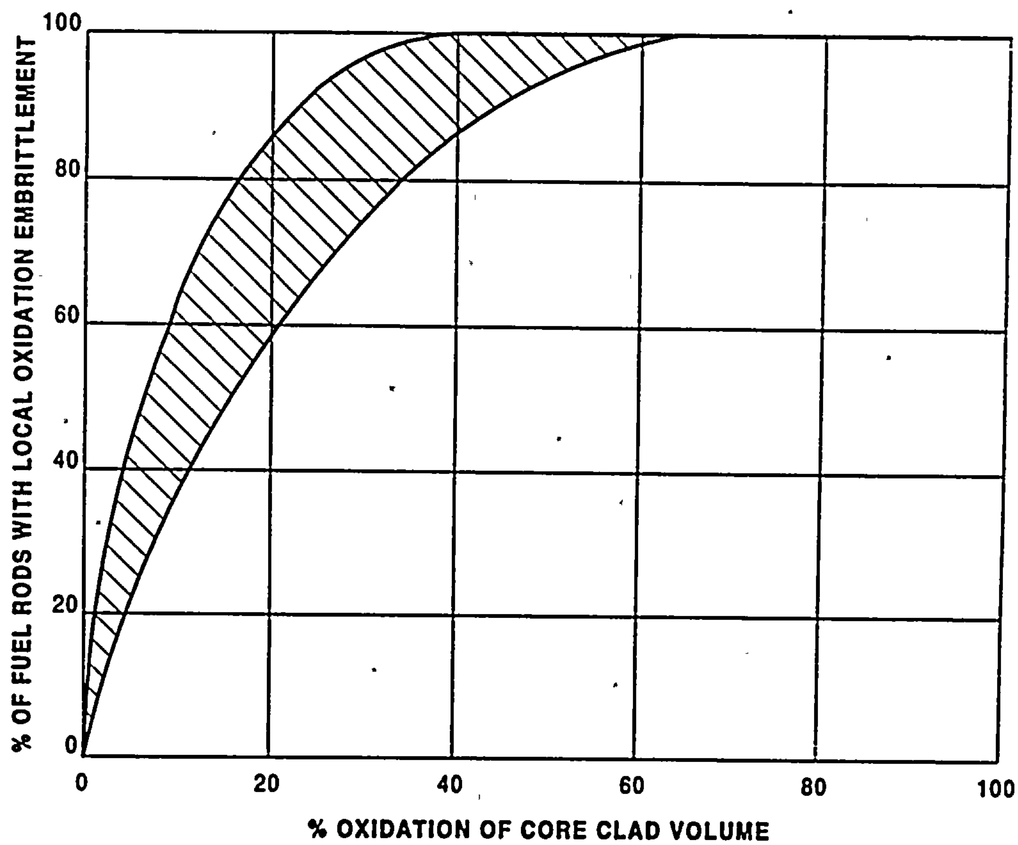


When the pressure in Form EP-0513, Step 2, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.10 Figure 9 - % of the fuel rods with oxication embrittlement vs. total core oxidation for 1% to 3% decay heat and 300 PSIA to 2500 PSIA when coolant level drops by boil-off with no inlet flow until core is rapidly quenched

FIGURE 9

% OF THE FUEL RODS WITH OXIDATION EMBRITTLEMENT vs TOTAL CORE OXIDATION FOR 1% TO 3% DECAY HEAT AND 300 PSIA TO 2500 PSIA WHEN COOLANT LEVEL DROPS BY BOIL-OFF WITH NO INLET FLOW UNTIL CORE IS RAPIDLY QUENCHED



8.11 Figure 10 - Sample locations appropriate for core damage assessment

FIGURE 10

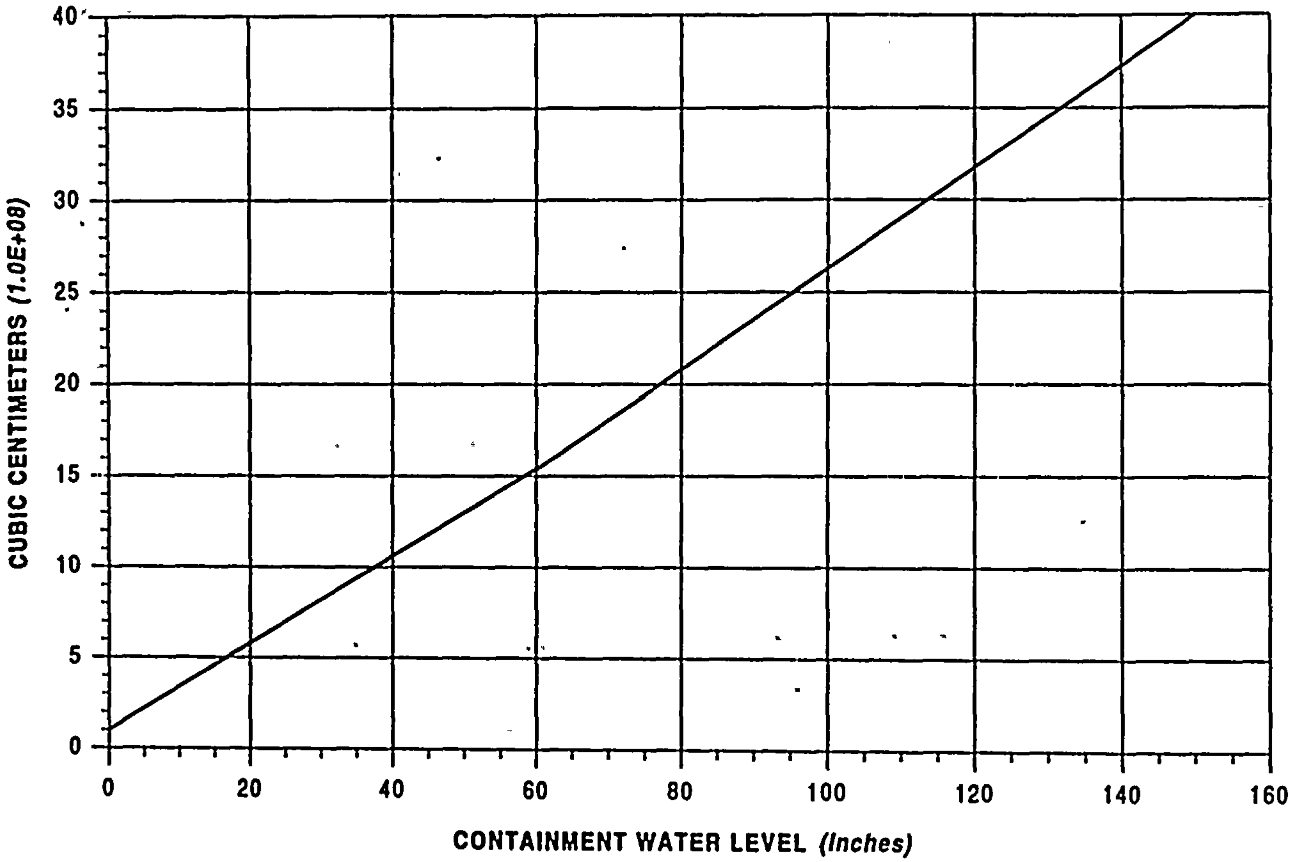
SAMPLE LOCATIONS APPROPRIATE FOR CORE DAMAGE ASSESSMENT

ACCIDENT SCENARIO	RCS HOT LEG	CONTAINMENT SUMP	CONTAINMENT ATMOSPHERE	SHUTDOWN COOLING
Small Break LOCA Reactor Power > 1%	YES	....	YES	YES
Small Break LOCA Reactor Power < 1%	YES	....	....	YES
Small Steam Line Break	YES	....	....	....
Large Break LOCA Reactor Power > 1%	YES	YES	YES	YES
Large Break LOCA Reactor Power < 1%	....	YES	YES	YES
Large Steam Line Break	YES	....	YES	....
Steam Generator Tube Rupture	YES	....	YES	....

8.12 Figure 11 - Containment water volume vs. Containment water level

FIGURE 11

CONTAINMENT WATER VOLUME vs CONTAINMENT WATER LEVEL



Appendix H - Autodialer Activation

NOTE

If the declared emergency situation is terminated prior to activation of the autodialer, do not activate the autodialer. The Shift Manager / Emergency Coordinator will direct the use of the autodialer. If the autodialer cannot be activated from the PVNGS Technical Support Center, contact Emergency Planning for assistance.

1.0 Activating the autodialer.

1.1 Power up the autodialer unit.

1.2 When the "ATERM" screen appears, press <F2>.

1.3 At the "Enter Password" prompt, type mlog and press <ENTER>.

1.4 Select the "Administrator" option and press <ENTER>.

1.5 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.6 Type your password and press <ENTER>.

1.7 Scroll down slowly and highlight the appropriate option from the following choices:

1.7.1 Unit 1 Setup (for Emergency Response Notifications)

1.7.2 Station Setup (for Fire Department activation)

1.8 When the appropriate option is highlighted, press <ENTER>.

1.9 Highlight the appropriate selection from the following choices:

1.9.1 E (actual emergency) / (classification)

1.9.2 D (drill) / (classification)

1.9.3 T (test) / (classification)

1.10 When the appropriate selection is highlighted, press <ENTER>.

1.11 When the "Working - Please Wait" dialog box disappears, press <ESC> two times.

NOTE

There may be a file transfer operation at this point. In a case of the file transfer dialog on the screen, wait until file transfer is completed (dialog box disappears) before continuing on to next step.

1.12 Select the "Administrator" option again and press <ENTER>.

1.13 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.14 Type your password and press <ENTER>.

1.15 Select the appropriate designator from the following choices:

1.15.1 Emergency Activation

1.15.2 Drill Activation

1.15.3 Test Activation

1.16 When the appropriate option is highlighted, press <ENTER>.

1.17 Select the appropriate Unit and press <ENTER>.

CAUTION

Selecting the option "Yes" (Y) in the next step STARTS activation. There is no additional confirmation step to allow you to back out of an activation prior to its commencement if you select the "Yes" option.

1.18 At the prompt "You have selected system (Emergency/Drill/Test) Activation for (UNIT 1/2/3/PVNGS STATION) location. The system is not currently staffing. Are you certain that you wish to continue?", type Y (yes) or N (no).

1.19 Ensure that the system has been activated by verifying the appearance of status screens displaying Emergency Response Organization position information as responders are reached.

1.20 If the autodialer failed to activate or failed to complete the notification process, notify the Shift Manager / Emergency Coordinator that the autodialer in the Technical Support Center failed the activation process. If necessary, inform the Emergency Coordinator of the current status of the system.

2.0 Terminating the autodialer activation.

2.1 From the "Monitoring Staffing for Unit (1/2/3/PVNGS Station)", select <F2> "Stop Staffing".

2.2 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.3 Type your password and press <ENTER>.

2.4 A "Real Time" fax report dialog box will display followed by a "Working - Please Wait" dialog box. When the "Working - Please Wait" dialog box disappears, the "Monitoring Staffing" screen also disappears.

2.5 The main Coordinator screen appears with "(RE)ACTIVATED, NOT STAFFING" in the left side of the upper box on the screen.

2.6 Select the "Administrator" option and press <ENTER>.

2.7 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.8 Type your password and press <ENTER>.

2.9 Select the "RESET" option and press <ENTER>.

2.10 After the "Working - Please Wait" dialog box disappears, press the <ESC> key once.

2.11 Select the <CTRL> + <RIGHT SHIFT> (Hold down the "control" key and simultaneously press the "Shift" key on the right hand side of the keyboard), to bring up the ATERM SPECIAL FUNCTIONS dialog box. Highlight "END ATERM SESSION" and press <ENTER>.

2.12 The ATERM Login screen should appear. This action terminates the modem session from the workstation to the Autodialer.

2.13 When emergency notifications have been completed, inform the Emergency Coordinator of any unaffirmed Emergency Response Organization positions.

Appendix I - Assembly

1.0 General information

1.1 Assembly is recommended at the Alert classification level unless the Emergency Coordinator is reasonably assured that the condition does not have the potential to further degrade. Accountability is required for a Site Area Emergency or a General Emergency and must be completed within 30 minutes following the request for Accountability. Accountability does not have to be performed immediately following the request for Assembly.

1.2 Designated Assembly Areas within the Protected Area are the Control Room/Satellite Technical Support Center, Technical Support Center, Operations Support Center, and Containment (Modes 5, 6, and Defueled, if appropriate). Designated Assembly Areas beyond the Protected Area are major buildings within the Owner Controlled Area having the capability of receiving Plant Paging System announcements.

1.3 Essential personnel are Emergency Response Organization personnel currently required for duty, and individuals engaged in Emergency Coordinator authorized critical work. If directed, essential personnel in an Unaffected Unit who normally respond to their Assembly Area will respond to the Affected Unit Assembly Area.

1.4 If the Security Computer System is not functioning, Security personnel will manually account for Protected Area personnel at Security Headquarters. Protected Area Assembly Area supervision will accommodate accordingly at each of their respective locations.

2.0 Emergency Coordinator actions

2.1 For Assembly/Accountability (required for SAE and GE, optional for Alert), perform the following:

2.1.1 Sound the Unit Assembly Signal for approximately 30 seconds.

2.1.2 Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a ____________________ exists in Unit ___. Assembly is required. All personnel report to your designated Assembly Area." Provide instructions on areas to avoid as appropriate.

2.1.3 Repeat sounding the Unit Assembly Signal and the message once. This responsibility can be delegated.

2.1.4 Direct the Security Director to complete supplemental onsite notifications and activate the autodialer (6470 / 6471 / 6472, 4444 or dedicated line or radio).

2.1.5 Personnel assembly is accomplished as follows:

2.1.5.1 Personnel in Containment are to secure work safely, report to the 140' hatch, and await instructions.

2.1.5.2 Emergency Response Organization members are to report to their Emergency Response Facilities.

2.1.5.3 Personnel in the Protected Area engaged in EC-authorized critical work are to report to the OSC, STSC, or TSC and card in on the ACAD card reader before returning to work.

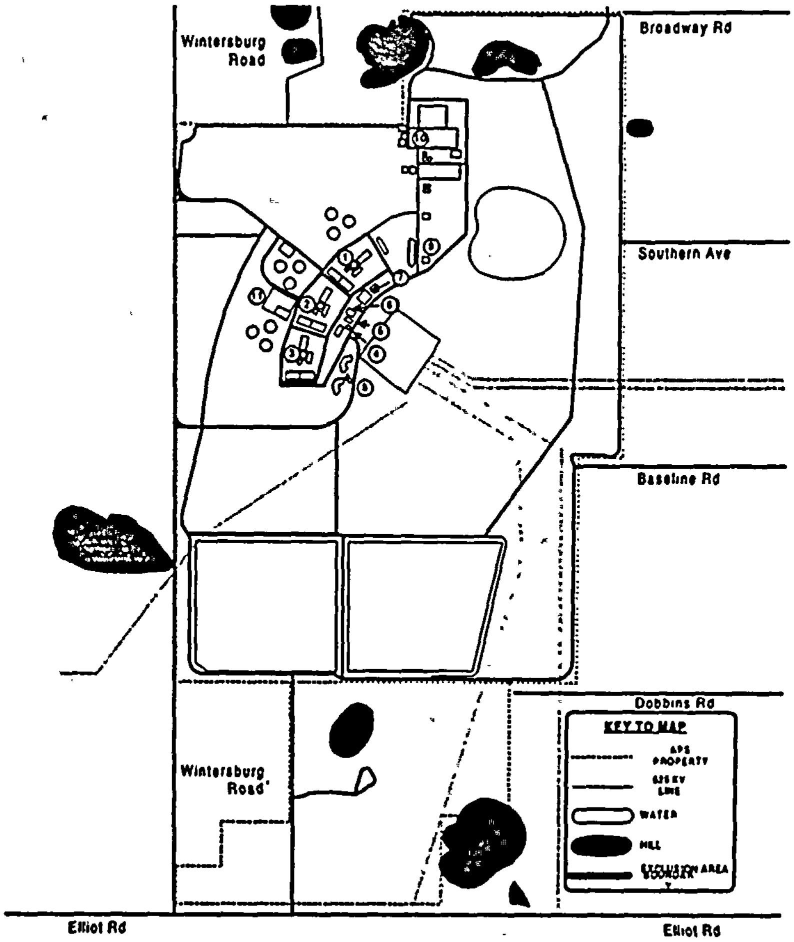
2.1.5.4 All other personnel, whether inside or outside the Protected Area., are to report to the nearest Assembly Area outside the Protected Area. These are considered to be non-essential personnel.

2.1.6 Ensure that assembling personnel each register their ACAD in the card reader. If the ACAD card reader is inoperable, direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms). Collect all forms and fax them to CAS.

2.1.7 To terminate Assembly by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.1.8 To terminate Assembly by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

The following site map details designated Assembly Areas to be used for assembling personnel when Assembly has been directed by the Emergency Coordinator.



Protected Area	Owner Controlled Area
1. Unit 1 Power Block	6. Building D
2. Unit 2 Power Block	7. Buildings E and F
3. Unit 3 Power Block	8. Buildings A, B, C
4. Security Headquarters	9. Transportation
5. Technical Support Center	10. Water Reclamation Facility Admin
	11. North Annex and Warehouse

2.2 If Accountability is to be conducted after Assembly, perform the following:

2.2.1 Request CAS Security personnel (6470 / 6471 / 6472, or 4444 or dedicated line or radio) to perform Accountability and to provide the report within 30 minutes.

2.2.2 Advise the Security Director to locate any unaccounted individuals.

2.2.3 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

2.2.4 Maintain continuous accountability of STSC personnel after Assembly. It is the position of PVNGS management that continuous accountability be maintained by knowledge of those individuals inside, and controlling access to, the Protected Area. Specific locations, i.e., Sector designation, of individuals inside the Protected Area may be ascertained by various methods, such as use of the Security Computer System and associated ACAD card readers, use of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms) in the OSC, Protected Area Assembly Area Supervisor knowledge, and Central Alarm Station (CAS) Operator knowledge. It is through a combination of these available administrative resources that continuous accountability of personnel inside the Protected Area can be maintained. The responsibility for maintaining continuous accountability of personnel within the envelope of each of the emergency response facilities within the Protected Area lies with the appropriate facility manager.

2.2.5 To terminate Accountability by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.2.6 To terminate Accountability by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

2.2.7 To terminate Accountability by a Site Evacuation, see Appendix J - Site Evacuation.

3.0 **Security Director actions**

3.1 When Assembly is directed, search the following areas in each Unit:

3.1.1 A-213 / A-217, CEDMCS Rooms

3.1.2 AC-04 / AC-13, Containment Spray Pump Rooms

3.1.3 AC-05 / AC-10, LPSI Rooms

3.1.4 AB-08, Gas Stripper Room

3.1.5 AB-02 / AB-10 / AB-11, 77' / 87' Mechanical Penetration Rooms

3.1.6 Y-105 / Y-106, 84' Pipe Density Tunnel

3.1.7 F-106, Fuel Cask Loading Area

3.1.8 R-211, 120' Radwaste Control Room

3.1.9 A-108 / A-109, 100' EW Heat Exchanger Rooms

3.1.10 A-124 / A-123, 88' Essential Pipe Chase

3.1.11 A-231 / A-232, Valve Gallery

3.1.12 A-210 / A-217 / A-218, Boron Injection Rooms

3.1.13 A-312 - R-303 - R-308, Waste Gas Panel Aisle

3.1.14 Y-101, 90' Nuclear Cooling Condensate

3.1.15 C-111, MSSS 100' Valve and Pipeway Area

3.1.16 Y-102 / Y-103, Spray Pond Pump Rooms

3.1.17 TSC Diesel Room

3.2 Search the following non-designated Assembly Areas and buildings outside the Protected Area for personnel:

3.2.1 Evaporation Ponds

3.2.2 SRP Switchyard

3.2.3 80-Acre Lake

3.2.4 Site Landfill

3.2.5 Neutrino Facility

3.3 When searches have been completed, advise Secondary Alarm Station personnel of the search status.

3.4 Lock down the Protected Area.

3.5 Notify the Water Reclamation Facility Control Room of the Assembly directive to ensure WRF personnel are notified to assemble.

3.6 Support the Emergency Coordinator with post-Assembly activities.

3.7 For Accountability, perform the following actions.

3.7.1 Ensure that the Emergency Coordinator receives a detailed Accountability report within 30 minutes following the request.

3.7.2 Using the Unit Evacuation System and/or the site-wide page, locate any unaccounted individuals identified on the detailed Accountability Report.

3.7.3 If necessary, coordinate with Fire Protection personnel to locate and assist unaccounted individuals identified on the detailed Accountability Report.

4.0 Assembly Area Supervision actions

4.1 Ensure assembling personnel each register their ACAD in the card reader.

4.2 If the ACAD card reader is inoperable, perform the following actions:

4.2.1 Direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms).

4.2.2 Collect all forms and transmit them by facsimile (FAX 2687) to Security supervision.

4.3 If essential personnel are dispatched from an Assembly Area prior to completion of Accountability, account for them via one of the following methods (preferred listed first):

4.3.1 Transmit a copy of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), by facsimile (FAX) to Security supervision.

4.3.2 Notify Security supervision by telephone (6470 / 6471 / 6472) of name and ACAD numbers for the appropriate individuals as listed on an Accountability Form.

4.4 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

Appendix J - Site Evacuation

1.0 General information

1.1 Although Site Evacuation is required at the General Emergency level, it is an option for the Emergency Coordinator to determine the need for and order a site evacuation of non-essential personnel at a less severe classification level. The Emergency Coordinator may also direct sheltering or an early dismissal of personnel prior to a danger of radiation exposure.

1.2 Personnel who are not identified as Emergency Response Organization staff members are considered non-essential. This excludes onsite and offsite assistance personnel who are currently engaged in emergency response activities in direct support of the Emergency Response Organization.

1.3 It is imperative that onsite organization efforts associated with the evacuation are completed prior to notification of all non-essential personnel by the Emergency Coordinator of the need to evacuate the site. Security personnel must be strategically located to effect an orderly evacuation. A disorderly evacuation could increase the potential for personal injury and site security efforts should be coordinated with local law enforcement agencies to lower this potential.

1.4 Buckeye Airport is the preferred reassembly area due to additional radiological support provided by the Arizona Radiation Regulatory Agency and additional security support provided by local law enforcement agencies.

2.0 Emergency Coordinator actions

2.1 After actions to organize the evacuation have been completed and security measures have been established, transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. Site evacuation for non-essential personnel is required. Proceed to your own vehicles and follow the instructions from Security."

2.1.1 Sound the Site Evacuation Signal for approximately 30 seconds.

2.1.2 Repeat the message once. This responsibility can be delegated.

3.0 Radiation Protection Monitor / Radiological Assessment Coordinator actions

3.1 Consult with the Security Director / Security Coordinator to determine the evacuation route and site egress point.

3.2 Designate one or more radiological monitoring team(s) who will go to the Reassembly Area at Buckeye Airport to provide monitoring of personnel and vehicles.

3.3 In conjunction with the Security Director / Security Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

3.3.1 After the briefing, direct the radiological monitoring team(s) to take the following actions:

3.3.1.1 Obtain a copy of EPIP-06, Reassembly Area Operations.

3.3.1.2 Obtain two to four friskers (RM-20).

3.3.1.3 Obtain one to two dose rate instruments.

3.3.1.4 Obtain one two-way radio.

3.3.1.5 Obtain the Reassembly Area key.

3.3.1.6 Proceed immediately to the Reassembly Area at the Buckeye Airport using the appropriate site egress and evacuation routes.

NOTE

EPIP-06, Reassembly Area Operations, is designed to prepare the Reassembly Area for use in accordance with the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure. It should be utilized only for the time period prior to the arrival of state officials. Thereafter, the State of Arizona Standard Operating Procedure will be used to direct Reassembly Area Operations.

3.3.1.7 Upon arrival at the Reassembly Area, implement EPIP-06, Reassembly Area Operations, and transition to the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure upon arrival of state officials.

4.0 Security Director / Security Coordinator actions

4.1 Consult with the Radiation Protection Monitor / Radiological Assessment Coordinator to determine the evacuation route and site egress point.

4.2 The Security Director will complete supplemental onsite notifications prior to the Site Evacuation.

4.3 Inform Security supervision of the site egress and evacuation routes selected. Direct Security supervision to take the following actions and to report when completed.

4.3.1 Instruct a Security Officer to perform the following actions:

4.3.1.1 Obtain the emergency equipment for a Site Evacuation from Security Headquarters.

4.3.1.2 Prepare a selected Security vehicle (Security Shift Van preferred) with the emergency equipment.

4.3.1.3 Assume a strategic location at the designated site egress point.

4.3.1.4 Report when in position at the egress point.

4.3.1.5 Advise the CAS / SAS of status upon arrival at the Reassembly Area.

4.3.2 As determined by existing radiological conditions, direct Members of the Security Force to establish security measures and traffic flow requirements using personnel appropriately.

4.3.3 Advise local law enforcement agencies of the designated site egress point, the selected evacuation route, and the destination.

4.3.4 Contact the Water Reclamation Facility Control Room at Extension [3007] and inform the WRF Shift Supervisor of the need to evacuate the site, the designated site egress point, and to direct his / her personnel to load their vehicles to capacity and form a single line behind the lead Security vehicle at the designated site egress point.

4.4 In conjunction with the Radiation Protection Monitor / Radiological Assessment Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

4.4.1 Direct the Reassembly Team Leader(s) to obtain emergency van key boxes for vans located in the Operations and North Annex parking lots from the Emergency Operations Facility Activation Room. The keys are to be dispensed only to those personnel requiring van keys.

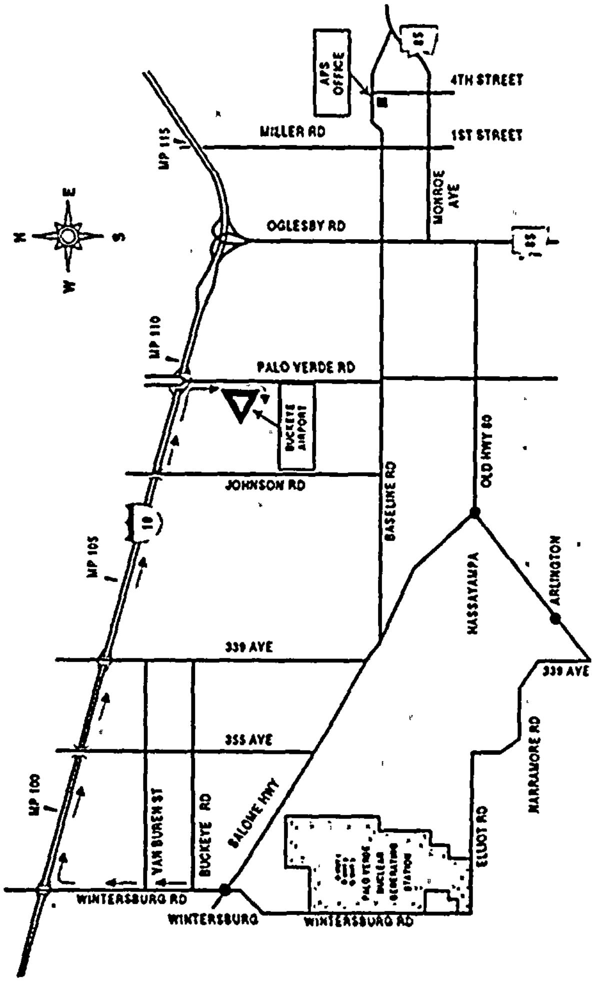
4.4.2 Direct the Reassembly Team Leader(s) to meet with the lead Security vehicle at the site egress point selected.

4.4.3 Direct the lead Security vehicle driver that when automobile and van drivers have formed a single line behind the lead Security vehicle at the designated site egress point, to proceed to the Buckeye Airport using the preselected evacuation route. Local law enforcement agencies will aid in the evacuation process, if required.

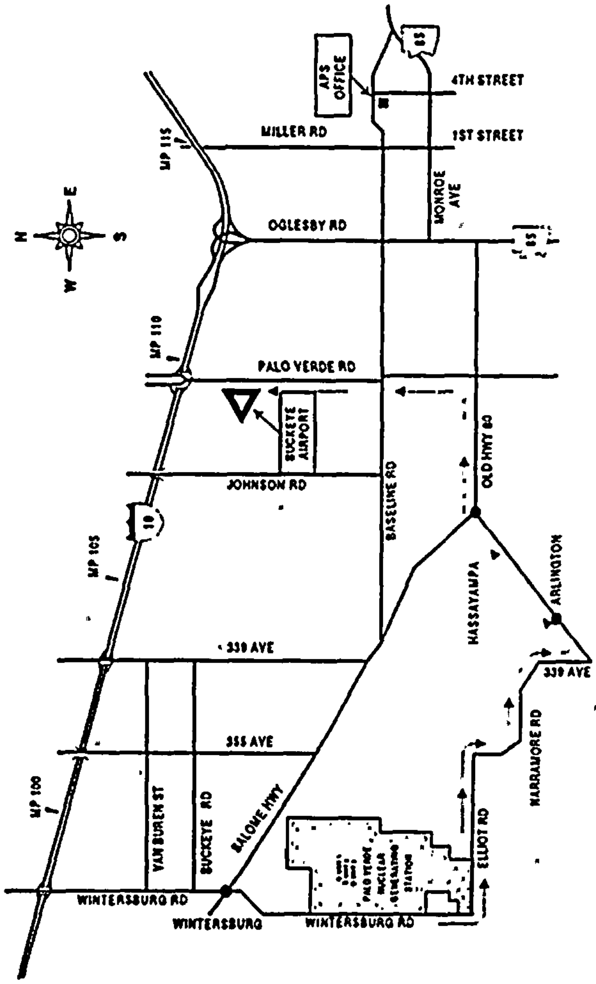
4.5 When the site has been evacuated, direct Security supervision to conduct searches of all buildings and areas outside the Protected Area for non-essential personnel.

5.0 Site Evacuation routes

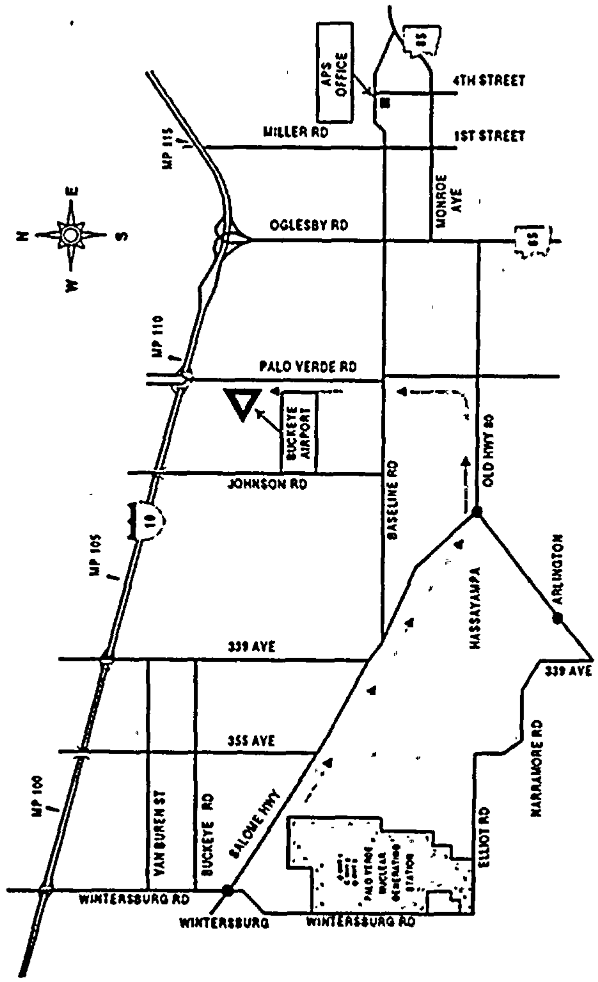
Site Evacution route #1



Site Evacuation route #2



Site Evacuation route #3



Appendix K - Emergency Exposures and KI

1.0 Introduction

1.1 Content

1.1.1 Planned Special Exposures, as defined in 10 CFR 20.1003 and 10 CFR 20.1206, are specifically excluded from guidance provided herein.

1.1.2 The instructions provided in this document assume that time is available for performing the appropriate sections. When circumstances dictate immediate actions, documentation associated with preliminary actions must be completed as soon as possible following those actions.

1.2 Noteworthy items

1.2.1 The Radiation Protection Monitor / Radiological Protection Coordinator shall advise the Emergency Coordinator on exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.2 The Emergency Coordinator shall authorize radiation exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.3 The Emergency Coordinator shall authorize use of Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM.

1.2.4 Personnel authorized to receive dose in excess of.25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be volunteers working under direct authorization of the Emergency Coordinator.

1.2.5 Emergency exposures associated with life-saving actions shall be limited to a single occurrence per lifetime.

1.2.6 Volunteers 45 years of age or older should receive primary consideration. When possible, the radiation exposure history of a volunteer should be researched and inspected prior to authorization. Minors are specifically excluded as volunteers.

1.2.7 Females shall not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

1.2.8 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be briefed, if time permits, on hazards and potential consequences prior to performing activities associated with that authorization. In cases when immediate actions are required, verbal authorization may be granted provided that all documentation associated with the authorization is completed as soon as possible following the actions. In all cases, subsequent dose extensions will not be granted prior to completion of evaluation documentation associated with preceding dose extensions.

1.2.9 Minimum documentation required for individuals authorized to receive dose not subject to the 10 CFR 20.1201(a) limits shall include an appropriate Radiation Exposure Permit and a completed Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms). Minimum authorizing documentation for use of KI shall be a completed Form EP-0503, KI Distribution (see Appendix C - Forms).

1.2.10 Administrative methods to minimize personnel exposure (ALARA) should remain in force to the extent consistent with timely rescue and corrective / protective actions per appropriate Radiation Protection Procedures.

1.2.11 Follow-up monitoring of individuals issued KI must be performed (whether or not exposure to radioiodine occurred) due to possible side effects associated with KI. In cases where radioiodine exposure has been confirmed, monitoring is required to maintain the thyroid blocking action by additional KI doses.

1.2.12 All dose received, including dose not subject to (beyond) 10 CFR 20.1201(a) occupational dose limits, will need to be subsequently documented in accordance with 10 CFR 20.2106.

1.2.13 Compliance with 10 CFR 20 during emergencies, including 10 CFR 20.1201(a) dose limits, shall occur as standard practice. Emergency related evolutions shall have a specific purpose involving high-priority actions necessary to save life, protect workers or the public, limit radiological release, or place the plant in a more secure condition relating to the emergency (protecting the plant).

1.3 Discussion

1.3.1 This document provides for personnel dose exposure control only under emergency conditions. For non-emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, should be used. During declared emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, remains applicable with the following provisions:

1.3.2 The current PVNGS Administrative Exposure Hold Point RRACS values established for site personnel will remain valid and the system will be used as a dose control tool for all activities in all Units and in all facilities.

1.3.3 The Radiation Protection Monitor, Radiological Protection Coordinator, or Radiological Assessment Coordinator may verbally authorize higher PVNGS Administrative Exposure Hold Points up to the 10 CFR 20.1201(a) limits for any particular emergency response team members. Use of Appendix A, Request for a Higher Administrative Hold Point, of Procedure 75AC-9RP01, Radiation Exposure and Access Control, during a declared emergency condition will not specifically be required.

1.3.4 Whereas the 10 CFR 20 limits apply to non-emergency conditions, every effort will be made to observe these limits under emergency conditions. They may be exceeded, if necessary, on a case-by-case basis, but only with advance authorization.

1.3.5 The Emergency Coordinator must authorize any dose beyond those limits specified in 10 CFR 20.1201(a) when the dose is projected to be in excess of any of those limits.

1.3.6 Emergency situations may include corrective / protective action circumstances where a high exposure to several individuals may greatly reduce exposure to many. A life-saving situation could also incur exposure approaching lethal levels when attempted. However, the vast majority of emergency response activity may be accomplished well within normal radiation dose controls.

1.3.7 Reflecting on this concept, the Environmental Protection Agency's (EPA's) guidance specifies that in the absence of special situations (e.g., life-saving, etc.), the 10 CFR 20 limits should be followed. An activity to protect valuable property is limited to 10 REM when a lower projected dose is not practicable. Life-saving activities on a voluntary basis have no upper limit established, but are not performed without the appropriate conditions applied.

1.3.8 Palo Verde Nuclear Generating Station has adopted this EPA guidance for emergency workers.

2.0 Emergency Exposure Dose Limits

2.1 Notes

2.1.1 The RPM / RPC may authorize doses up to the 10 CFR 20 limits - the EC must authorize doses beyond the 10 CFR 20 limits.

2.1.2 "Protecting Valuable Property" includes equipment-saving measures as well as sampling, surveillance, or repair activities that, in the opinion of the Emergency Coordinator, constitutes plant protective measures.

2.1.3 The exposure that workers incur for the protection of large populations may be considered justified for situations in which the collective dose avoided by the emergency operation(s) is significantly larger than that incurred by the workers involved.

2.2 Dose Limit Determination

2.2.1 Use the following chart to determine dose limits for which authorization of dose extensions may be required:

DOSE LIMITS	TEDE	TODE	LDE	SDE	AUTHORIZATION REQUIRED BY:
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM per year	50 REM * per year	15 REM per year	50 REM per year	RPM / RPC up to these limits EC to go beyond these limits
EPA Guidance for Protecting Valuable Property	10 REM per event	100 REM per event	30 REM per event	100 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations	≤25 REM per event	≤250 REM per event	≤75 REM per event	≤250 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	>25 REM per event	>250 REM per event	>75 REM per event	>250 REM per event	EC only *(and a risk discusion must be conducted)*

* Sum of Deep Dose Equivalent and Committed Dose Equivalent (DDE + CDE). EPA does not use TODE (Total Organ Dose Equivalent); EPA uses CDE in this column. PVNGS assesses TODE and, via this Instructional Guide and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

3.0 Thyroid CDE Risk Assessment

3.1 Outline

3.1.1 Use of this section assumes that conditions exist such that the probability for significant Iodine exposure is high. This section must initially be completed for each team and subsequently repeated for each team as conditions change. The sequence for radioiodine risk assessment will encompass the following actions:

1. Making a determination if the team's activity will be an Iodine concern
2. Determining Thyroid CDE dose rates for the team's work area
3. Performing a risk assessment for each team

3.2 Determining if Iodine is a concern.

3.2.1 Review internal plant conditions, component failure or leak areas, and external plume path conditions.

3.2.2 Instruct survey team(s) to obtain air samples in projected work areas and report the results of direct frisk readings on the particulate and Iodine media, in accordance with Form EP-0484, Air Sample Data (see Appendix C - Forms).

NOTE

The "µCi/cc" Iodine RMS channel indications on the RMS DCU or on ERFDADS cannot be used in the Field Sample Data Assessment for estimating Thyroid CDE rates. They represent accumulated, rather than current, airborne activity.

3.2.3 Review any alarming Radiation Monitoring System particulate, Iodine, and gas channels for indications of areas where other Iodine samples should be obtained.

3.2.4 For release path activity, collect appropriate particulate and Iodine samples, as necessary, from RMS Skids for counting on a multi-channel analyzer. If the sample volume is known, "µCi/cc" values may be obtained. Contact the Radiological Monitoring Technician as required.

3.3 Determining Thyroid CDE dose rates.

NOTE

A Thyroid CDE Dose Rate Estimate can be determined by using either the MESOREM printed report or field samples. The MESOREM printed report will provide recommendations to administer KI in affected sectors if the projected Thyroid CDE dose at the Site Boundary for the duration of the projected release time is > 25 REM. Additional Thyroid CDE dose rates will be provided for 2, 5, and 10-mile centerline distances. Field samples will provide more reliable data which can be used for the dose rate determination. For this reason, field samples are preferred when time is available.

3.3.1 For rate estimates using the MESOREM printed report, perform the following:

3.3.1.1 Review the 2, 5, and 10-mile Thyroid CDE dose rates and evaluate the dose where ARRA and RFAT Teams are expected to be operating. Since time is required for review and approval of data by the RAC, this process may not be applicable to the RPM.

3.3.1.2 For onsite receptors, review the "MAX" Thyroid CDE Dose Rate, which is calculated for a distance of 0.25 miles from the release point.

NOTE

The following applies to readings taken on Silver Zeolite (AgX) cartridges: On-scale frisker readings result in no requirement to administer KI. Full-scale frisker readings, i.e., 500,000 cpm, correlate to 1.6E-05 µCi/cc activity, which corresponds to slightly under 21 REM / hour. A frisker reading of 625 cpm correlates to the DAC limit of 2.0E-08 µCi/cc. On-scale RO-2 (closed window) readings of 3 mrem / hour at 1 hour into the event (after reactor scram) correlate to 6.0E-06 µCi/cc I131 equivalent, corresponding to approximately 8 REM Thyroid CDE / hour.

3.3.2 For rate estimates using field sample data, perform the following:

3.3.2.1 Obtain the I131 equivalent µCi/cc values from field team personnel. As time permits, obtain isotopic analysis results of the samples.

3.3.2.2 Direct the field teams to obtain additional samples needed to back-calculate and update dose projections until agreements in data are reached between projections and field samples. Data obtained via this process may be used for locations where no data is available.

3.3.2.3 Using the data obtained from onsite / offsite field samples, determine the Thyroid CDE dose / dose rates by multiplying the Iodine concentration from the Air Sample Data form (as reported by the field team) by 1.3E+06. The result is the equivalent Thyroid CDE dose rate in REM / hour. This calculation may also be executed on Form EP-0481, Air Sample Data (see Appendix C - Forms).

3.3.3 Determine the most accurate Thyroid CDE dose rate estimate from the review of all available data.

3.4 Performing a Team Risk Assessment.

NOTE

This process requires frequent performance during an emergency event when workers may be exposed to Iodine activity. Log entries should be used as documentation for the ongoing review process. Assessments should be as accurate as possible without resulting in over-conservative measures.

3.4.1 Determine the estimated stay time for the individual / team in the Iodine environment.

3.4.2 Select the most appropriate Thyroid CDE dose rate per the available data for the Iodine environment which will be entered.

3.4.3 Multiply the Thyroid CDE dose / hour by the estimated stay-time (in hours) to derive the estimated dose without application of protection factors.

3.4.4 Determine applicable protection factors of the protective equipment that will be used.

3.4.5 If the protection factors can be used to compensate for protective equipment, correct the estimated dose for the appropriate protection factor.

NOTE

Risk from a thyroid dose > 25 REM CDE warrants dispensation of KI.

3.4.6 If the net estimated dose is clearly < 25 REM Thyroid CDE, no further action is required.

3.4.7 If the net estimated dose is near or > 25 REM Thyroid CDE, proceed to Section 5 of this document, Potassium Iodide Administration.

3.4.8 Ensure the individual / team is appropriately briefed per Section 6 of this document, Team Briefing and Deployment.

4.0 Emergency Exposure Authorization

4.1 Preparing the authorization.

NOTE

This section requires documentation based on a review of the radiological evaluation of the situation requiring potential emergency exposure.

4.1.1 Perform a radiological evaluation of the situation that requires potential emergency exposure.

4.1.2 When the radiological evaluation has been reviewed, retrieve Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

4.1.3 On Form EP-0300 (see Appendix C - Forms), the ORIGINATOR Section shall be completed by the RPM / RPC (or staff), adhering to the following guidelines:

4.1.3.1 Team personnel are volunteers working under direct authorization of the Emergency Coordinator.

4.1.3.2 Females will not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

4.1.3.3 Personnel have been made aware of potential hazards associated with exposure received under emergency conditions.

4.1.3.4 The individual current exposure status of each team member has been (will be) examined and is (will be) known.

4.1.3.5 Volunteers 45 years of age or older have been given primary consideration.

4.1.3.6 Emergency exposures associated with life-saving actions will be limited to a single occurrence per lifetime.

4.1.3.7 Team members consist of the most qualified individuals.

4.1.4 On Form EP-0300 (see Appendix C - Forms), indicate clearly in the "Reason for Request" area that an Emergency Classification has been declared and add the reason for team entry.

NOTE

On Form EP-0300 (see Appendix C - Forms), all signatures designate acceptance of the necessity to conduct a risk discussion, as time permits, with all workers authorized dose extensions for life-saving efforts, i.e., those pertaining to the lower two categories of the Emergency Exposure Dose Limit Chart in Section 2.2 of this Appendix. The review will encompass the risk review data from Section 6.1 of this Appendix.

4.1.5 The Radiation Worker shall sign on the appropriate line(s) in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms).

4.1.6 The RPM / RPC shall sign on the appropriate line in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms) and attach to the form any documentation of radiation surveys, etc. (if time permits) which were used for the radiological evaluation previously completed.

NOTE

The Emergency Coordinator has sole authority to approve radiation exposures beyond the 10 CFR 20 radiation exposure limits up to the Emergency Exposure Limits specified in Section 2.2 of this document.

4.1.7 If deemed appropriate, the Emergency Coordinator will approve (authorize) the request for the limit(s) desired per the Emergency Exposure Dose Limits specified in step 2.2 of this document.

4.1.8 The RPM / RPC shall follow up on emergency exposure for each individual per section 7.1.

5.0 Potassium Iodide Administration

5.1 Dispensation of KI.

NOTE

For the most effective utilization, KI should be administered at least one-half hour prior to anticipated Iodine exposure. However, KI will maintain substantial benefit even when taken three or four hours following acute Iodine exposure.

5.1.1 Obtain required approval for KI administration from the EC.

5.1.2 Ensure that the Emergency Exposure Authorization has been completed. TEDE and TODE limits and required approvals for exceeding dose limits must be established coincident with approval for the administration of KI.

5.1.3 Initiate documentation for each individual authorized KI administration by using one Form EP-0503, KI Distribution (see Appendix C - Forms), for each worker. Though not mandatory, record individuals' HPID Numbers and dates-of-birth on the forms.

5.1.4 If verbal approval is necessary, annotate "per telecon by (your name)" and sign the form as indicated.

5.1.5 Ensure a team briefing on the possible side-effects of Potassium Iodide, i.e., summarization of information on Form EP-0503 (see Appendix C - Forms), is conducted prior to the administration of KI to these individuals.

5.1.6 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one tablet to each individual authorized KI. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

5.1.7 The RPM / RPC shall follow up on KI administration for each individual per section 7.1.

6.0 Team Briefing and Deployment

6.1 Risk discussion criteria

6.1.1 Review the following information with all personnel who have been authorized emergency exposures in excess of 25 REM:

RISK REVIEW INFORMATION

Health Effects Associated with Whole Body Absorbed Dose Received Within a Few Hours	Whole Body Absorbed Dose *(RAD)*	Early Fatalities *(percent)* 2	Whole Body Absorbed Dose *(RAD)*	Prodromal Effects *(percent affected)* 3
(see EPA-400 Appendix B) 1	140	5	50	2
	200	15	100	15
	300	50	150	50
	400	85	200	85
	460	95	250	98

1 Risks will be lower for protracted exposure periods.
2 Supportive medical treatment may increase the dose at which these frequencies occur by approximately 50 percent.
3 Forewarning symptoms of more serious health effects associated with large doses of radiation.

Approximate Cancer Risk to Average Individuals from 25 REM Effective Dose Equivalent Delivered Promptly	Age at Exposure *(years)*	Approximate Risk of Premature Death *(deaths per 1000 persons exposed)*	Average Years of Life Lost if Premature Death Occurs *(years)*
(see EPA-400 Appendix C)	20 to 30	9.1	24
	30 to 40	7.2	19
	40 to 50	5.3	15
	50 to 60	3.5	11

Threshold Dose Levels for Acute Doses

	Effect	Threshold Organ Dose
The threshold effect is a concept for defining a minimum acute organ dose above which the described effect will *(not may)* occur in the exposed individual, although the occurrence may come later. It is not a risk estimate. It is a minimum level of detectability from a limited number of observations, so threshold values for humans are approximate values -- not absolute numbers.	Suppressed Sperm Coun	10 REM
	Damage to Fetus	10 REM *(but high risk of mental retardation requires use of a lower limit)*
	Thyroid Function Impaired	200 RAD
	Thyroid Made Hypothyroid	3,000 - 10,000 RAD
	Cataracts	500 - 1,200 RAD
	Skin Reddening	300 - 800 RAD
	Skin with Oozing Lesions	1,200 - 2,000 RAD

Organ systems are not expected to show symptoms of severe clinical pathophysiology for acute doses below a few hundred RAD. For additional information, see EPA-400 Appendix B.

6.2 Dispatching the team.

6.2.1 Inform the team leader(s) that dose authorization approvals are complete

6.2.2 Ensure that Radiation Protection personnel have a clear understanding on established dose limits and team entry abort points.

6.2.3 Dispatch the team.

NOTE

If the computerized dose tracking system (RRACS) is inoperable, dose records must be updated manually and annotated in the DOSIMETRY RECORD UPDATE Section of Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

6.3 Request the RPM / RPC / RAC to update RRACS. (This action may be completed during or after the entry). If Dosimetry personnel are not available, obtain the sealed "Emergency Dose Authorization Package" from an Operations Support Center Emergency Kit. Open the envelope and follow the instructions inside, using the supplied RRACS password to gain access to the system and update the hold point with the new authorized limit.

7.0 Subsequent Actions

7.1 Emergency exposure follow-up

7.1.1 Upon return of team members, collect all dosimetry for evaluation.

7.1.2 Ensure all team members are not deployed for further work until exposure evaluations have been completed.

7.1.3 Retrieve Appendix B, Record Exposure Evaluation, of Procedure 75RP-9ME23, Lost or Damaged Dosimetry, and initiate actions to complete the form.

7.1.4 Transmit all thermoluminescent dosimetry (TLDs) to Dosimetry for evaluation. Include information regarding which individuals require expedited dose reports.

7.1.5 During RRACS record update, ensure appropriate dose limits are reset to normal levels. Dosimetry personnel will complete the RECORDS UPDATE Section of the Record Exposure Evaluation Form.

7.1.6 Conduct a team debriefing at the conclusion of the job evolution and when exposure evaluations have been initiated.

7.1.7 Report any exposures authorized by the EC and received by team members to the Emergency Coordinator / Emergency Operations Director.

7.1.8 Ensure that the EC initiates actions to complete USNRC notifications of radiation exposures per 75AC-9RP04, Radiological Reports, if appropriate.

7.2 KI administration follow-up

NOTE

Performance of this section assumes personnel from Dosimetry, Medical, and Radiation Protection are available for support efforts.

7.2.1 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one (1) tablet to each individual authorized KI every 24-hours for three (3) days. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

7.2.2 Consult the Medical Department and determine if the need exists for extended KI administration periods by evaluating radiological exposures. In unusual circumstances, KI may be issued for a period of up to ten days. The Medical Department will provide KI dispensing instructions and will supervise KI administration.

7.2.3 Continue the monitoring of personnel for side-effects to KI and/or any radioiodine exposures that may have occurred.

7.2.4 When required documentation on each Form EP-0503, KI Distribution (see Appendix C - Forms), has been completed, forward the completed forms to Dosimetry. These forms become part of each individual's exposure history.

Appendix L - Accident Sampling

1.0 Introduction

1.1 Applicability

This Appendix is applicable to obtaining, handling, analyzing, and reporting samples pertaining to accident conditions in accordance with the requirements specified in NUREG-0654 and NUREG-0737. It provides the methodology for analysis of reactor coolant liquid, safety injection liquid, and Containment atmosphere samples. In addition, the document functions to provide instructions for RMS effluent sampling from the Plant Vent and Fuel Building Exhaust high range monitors for particulate and Iodine activity. Chemistry will usually be responsible for performance of this procedure with assistance from Operations and Radiation Protection personnel.

1.2 Prerequisites

Direction has been authorized and received for initiating the actions necessary to obtain accident sampling and analysis.

1.3 Precautions - general

1.3.1 Sampling activities require review of current and potential radiation and airborne activity to determine if actions associated with emergency exposures or issuance of KI need to be implemented.

1.3.2 When practical, the use of remote tools and shielding to minimize radiation exposure should be accomplished.

1.3.3 Monitoring for explosive atmospheres should be performed whenever plant, fuel, or sampling conditions indicate actual or potential elevated Hydrogen levels.

1.3.4 If possible, the sample should be counted in an Affected Unit laboratory. An Unaffected Unit laboratory should be prepared for analysis if conditions preclude counting in the Affected Unit laboratory.

1.3.5 Samples acquired during and after accident conditions should not be disposed of or destroyed without prior approval of the Chemistry Coordinator or the Emergency Coordinator.

1.4 Precautions - PASS inoperable

1.4.1 74DP-9CY02, Post-Accident Sampling System Program, provides direction for alternate sampling capability in the event that PASS becomes inoperable. Further direction is contained in 74OP-9SS05, Preplanned Alternate Sampling, which provides specific alternate sampling and collection methodology. The guidance in these procedures should be used in conjunction with this document for sample handling, control, and analysis.

1.4.2 When using the Preplanned Alternate Sampling methodology, dose rates and airborne activity will vary considerably, depending on plant conditions.

1.4.3 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, is based on using a PASS which is operable. The calculation assumes the CEDE dose to be negligible relative to the DDE.

1.4.4 Calculated data is not provided for specific Preplanned Sampling events beyond the data developed for PASS sampling for the following reasons:

1.4.4.1 In a Loss-of-Power (LOP) condition, the potential for localized airborne hot spots is high because ventilation / filtration will not be operating. The natural ventilation flows and flow paths resulting will be unpredictable.

1.4.4.2 Under abnormal plant conditions in which PASS is not operable, travel paths to and from sample areas, stay times in those areas, and plant conditions could vary widely from the projected calculated data comprising Section 9.0 of this document.

1.4.4.3 Use of supplied air, Self-contained Breathing Apparatus (SCBA), and/or other use of respiratory protection will most likely be required under accident conditions, as implementation of the procedure indicates significant plant conditions exist. The CEDE dose component may be crucial.

1.5 Precautions - RMS skid and sampling activity

1.5.1 Due to the potential for fluctuating area and release stack dose rates under accident conditions, the Chemistry and Radiological Monitoring Technician must maintain the Radiation Protection Monitor and Operations Support Center staff aware of their work areas and expected stay times to allow for dose control.

1.5.2 Dose rates and/or conditions may preclude accomplishing scheduled tasks. These conflicts should be brought to the attention of the Emergency Coordinator and Chemistry Coordinator for resolution.

1.6 Precautions for Chemistry Technician / Radiological Monitoring Technician

1.6.1 Sampling activities under emergency conditions prior to activation of onsite facilities will be authorized by the Onshift Organization - sampling activities under emergency conditions following activation of onsite facilities will be authorized by the Onsite Organization.

1.6.2 Prior to sampling work activities, all applicable technicians must sign the Emergency Radiation Exposure Permit and participate in a briefing conducted by Operations Support Center staff on current and expected conditions.

1.6.3 A working area telephone number should be provided to the Operations Support Center Coordinator and to the Chemistry Coordinator in the Technical Support Center. Available FAX machines may be utilized for additional communications with Technical Support Center staff.

1.6.4 During sampling activities, the Chemistry and/or Radiological Monitoring Technician should provide verbal updates to the Radiation Protection Technician, concentrating on actions which may cause a change in radiation levels.

1.6.5 Consider raising the alarm setpoints on RU-23, RU-26, and/or RU-158D commensurate with expected area dose rates. Consider isolating the taps on RU-9 and RU-10 to obtain representative sampling of a particular area, i.e., isolating RU-10 to monitor only the Chemistry Hot Lab area during sampling.

1.6.6 Verify the current operability of the sampling area ventilation system.

1.7 Precautions for Radiation Protection Technician

1.7.1 A determination must be made regarding protective equipment and area entry requirements prior to commencement of any sampling work. As soon as personnel are identified, extremity thermoluminescent dosimetry (TLD) packets should be prepared to avoid any delays in the sampling evolution.

1.7.2 Critical steps in the procedure should be reviewed with assigned personnel and expected stay times, sample exposure times, and critical areas should be determined. Expected exposures should be ascertained when reviewing available survey data, plant conditions, and RMS indications. Additional surveys should be obtained, if necessary. An RO-7 can be used to monitor dose rate changes in front of septum ports in extreme dose conditions.

1.7.3 Exposure limits, dose extensions, Potassium Iodide administration, and approvals can be obtained from the Radiation Protection Monitor / Radiological Protection Coordinator. If necessary, process additional exposure authorizations and/or KI distribution documentation (see Appendix K - Emergency Exposures and KI, and contact the RP Monitor for guidance). Ensure all documentation, including RRACS entries, are complete prior to proceeding with sampling evolutions.

1.7.4 A Radiation Exposure Permit should be prepared for all assigned sampling activities. Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), will aid in assurance that radiological controls and directions are established.

1.7.5 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, and the Briefing Guidelines in section 2.0 should be reviewed with all team members prior to dispatch.

1.7.6 Ensure that all samples collected are labeled, stored, and posted in accordance with 75RP-9RP15, Control and Storage of Radioactive Material.

1.8 Precautions - Chemistry Leader / Chemistry Coordinator

NOTE

The Chemistry Coordinator will function from the Technical Support Center following that facility's activation. Prior to activation, direction and/or recom-mendations may be obtained via telecommunications from an offsite Chemistry Leader if specific Chemistry information and/or direction is necessary.

1.8.1 The Chemistry Leader / Chemistry Coordinator should ensure that all personnel assigned duties regarding sampling and analysis are qualified and experienced on system operations.

1.8.2 In coordination with the Emergency Coordinator and Shift Technical Advisor / Reactor Analyst, the Chemistry Leader and/or Chemistry Coordinator should determine the samples required and the sampling priorities for current plant conditions. Consideration of and planning for RMS high range skid sampling options (3 P/I configurations are available), sampling per the Preplanned Alternate Sampling options, PASS sample options, and other RMS samples available should be included.

1.8.3 Analytical equipment required to analyze a post-accident sample should be prepared at an Alert, or higher, emergency classification, whether or not a post-accident sample has been requested. If radiation levels are prohibitive in the Affected Unit, preparations should be started in an Unaffected Unit.

1.8.4 Consideration should be given to allow at least 2 hours to elapse after a reactor trip prior to isolating a PASS RCS or Containment atmosphere sample:

1.8.4.1 2-hour decay could decrease local radiation levels by 2-2½ times

1.8.4.2 3-hour decay could decrease local radiation levels by up to 10 times

1.8.5 Containment and Auxiliary Building sump liquids may exhibit higher-than-normal radiation levels during accident conditions.

1.8.6 The Auxiliary Building sumps automatically pump to the TDS Tanks to prevent flooding and subsequent loss of the HPSI, LPSI, and CS Pumps. If RCS leakage to the Containment or Auxiliary Building sumps exists in conjunction with elevated RCS activity, monitoring and planning will be required for the extreme activity potential that can be transferred to the TDS Tank area outside of the Radwaste Building.

1.8.7 Safety Injection liquid samples can be used to estimate the Containment sump activity levels after a Recirculation Actuation Signal (RAS) has occurred or if the plant has been cooled down and Shutdown Cooling has been placed into service.

1.9 Precautions - Radiation Protection Monitor (RPM) / Radiological Protection Coordinator (RPC)

1.9.1 The RPM should direct, review, and monitor the actions of the Radiation Protection staff to ensure adequate pre-job surveys, REPs, and team briefings are provided for all sampling teams. The PASS Dose Information / Thumb Rules in section 9.0 and the Briefing Guidelines in section 2.0 of this Appendix should be used.

1.9.2 If exposures due to sampling activities are expected to approach or exceed those specified in 10 CFR 20.1201(a) or if high Iodine activity is potentially present, recommendations should be made to the Emergency Coordinator to implement guidance associated with Appendix K - Emergency Exposures and KI.

1.9.3 Communications between the Chemistry and Radiological Monitoring Technicians and the Operations staff should be maintained to ensure that changing plant conditions are understood and properly confirmed during all sampling activities. Any changes that occur to either monitored or unmonitored release pathways should be taken into account from an offsite perspective. Any changes that occur to onsite RCA boundaries due to internal and external dose limitations should also be considered as plant conditions change.

2.0 Sampling Briefing and Preparation

2.1 Briefing guidelines

The following Sampling Team Briefing Guidelines should be used when conducting the In-plant Team Briefing prior to sampling activities:

2.1.1 As a minimum, extremity dosimetry shall be placed on the middle finger of anyone handling sample tools or samples. Extremity dosimetry shall be utilized for Chemistry personnel working directly in front of septum ports on the Post-Accident Sampling System (PASS) or Radiological Monitoring (RM) Technicians collecting samples from Radiation Monitoring System (RMS) high range skids. Extremity dosimetry should be issued in accordance with site dosimetry procedures.

2.1.2 Due to the speed with which an accident sample is drawn, the RP Technician will probably not have sufficient time to collect an air sample and have it counted before the time at which the accident sample is drawn. Nor is there expected to be significant airborne activity released from the sample when using the PASS unit. Despite this assumption, an air sample should be prepared and run during the sampling activity to allow for the unexpected. RU-10 should be monitored constantly by the RM Technician. Preplanned Alternate Sampling activities will require additional actions based on implementation of section 7.0, Preplanned Alternate Sampling.

2.1.3 Proper labeling of samples with applicable times related to events will be crucial to the ongoing response to the emergency. All labeling activities should be performed from the long-term impact perspective. If extreme sample activity precludes labeling samples directly, the RP Technician shall ensure that outer postings are complete and that they provide direction for control of the samples.

2.1.4 The accident sampling team should thoroughly discuss each planned sample activity by stepping through this document and verbalizing the intent of each step and what is required to perform that step. Equipment should be verified available prior to starting actual sample collection. Plan for the unexpected; discuss what to do if a sample is dropped, a glass syringe breaks, etc. Any system breach will cause an immediate significant increase in Noble Gas activity.

2.1.5 The accident sampling team shall immediately inform the Operations Support Center Coordinator and the Chemistry Coordinator of significant problems or changes to the expected conditions as addressed in this briefing and on the REP.

2.1.6 The accident sampling team shall review the information comprising the PASS Dose Information / Thumb Rules in section 9.0 of this procedure, Sample Data Reference, prior to the start of sampling. All accident sampling team members shall also review current RMS indications. Preplanned Alternate Sampling teams shall employ continual RMS monitoring during all sampling evolutions.

2.1.7 When possible, use remote tools to handle high activity samples during sampling and analysis to provide maximum distance from the source. Maintain personnel exposures ALARA by observing all necessary precautions based on existing conditions.

2.1.8 The travel routes to and from the sample area should be reviewed to minimize dose. The route should be monitored for changes by OSC staff after an accident sampling team is dispatched.

2.1.9 Monitoring for an explosive atmosphere should be performed whenever plant / sampling / fuel conditions indicate elevated Hydrogen activity.

2.2 Preparing resources

NOTE

Emergency conditions may require immediate actions. If all actions outlined in the remainder of this Section cannot be completed prior to team dispatch, they may be completed in parallel with or as soon as possible following team dispatch.

2.2.1 When the team briefing has been completed and documented, ensure that all appropriate personnel data have been recorded on the applicable REP and have been entered into RRACS accordingly.

2.2.2 Ensure that all specified dosimetry and protective equipment has been issued.

2.2.3 Ensure that all RP pre-job surveys are complete and that preliminary postings are in place as required.

2.2.4 Ensure that the Chemistry, RP, and RM Technicians have each reviewed the actions in this document relative to critical hold points and that each has reviewed their planned sample survey and handling techniques in accordance with the Briefing Guidelines in section 2.0 and the PASS Dose Information / Thumb Rules specified in section 9.0 of this document.

2.2.5 Direct each accident sampling team member to perform an initial RMS review.

2.2.6 Instruct the RM Technician to monitor for unexpected changes on monitors near the sampling areas and near routes leading to and from the sampling areas.

NOTE

The choice of sampling method to be used is based on dose potential rather than on event categorization. Normal sampling systems may be employed under emergency conditions until or unless the dose potential mandates otherwise.

2.2.7 Based on sampling requirements, ensure that one of the following actions has occurred:

2.2.7.1 The Chemistry Technician has prepared either Chemistry Cart #1 or Chemistry Cart #2 for PASS sampling. Form EP-0051, Chemistry Cart #1 Preparation Checklist (see Appendix C - Forms), or Form EP-0052, Chemistry Cart #2 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.2 The Radiological Monitoring Technician has prepared Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.3 The Chemistry Technician has prepared equipment per the requirements specified in 74OP-9SS05, Preplanned Alternate Sampling (PASS is inoperable and PASP has been initiated.)

NOTE

Initially, two 1-inch attenuator blocks are used for the liquid and gas isotopic sample analyses. Initially, six 1-inch attenuator blocks are used for the particulate and Iodine sample analyses and the number of attenuator blocks are decreased, if necessary.

2.2.7.4 Verify that an efficiency calibration for necessary attenuators has been performed in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System, for each detector to be used. A PASS detector is any predefined detector which has been calibrated and verified using lead attenuators or collimators within 25% of certificate activity in accordance with 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.5 Verify that calibrations have been performed on the Multi-Channel Analyzer (MCA), Autotitrator, Ion Chromatograph, and Gas Chromatograph and that they meet the criteria specified in 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.6 If the Gas Chromatograph is to be used, ensure that the exhaust is directed to an operating vent fan.

3.0 PASS depressurized liquid sampling

3.1 Preparing for sample collection

3.1.1 Place the temporary syringe disposal shield inside the sample room.

3.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

NOTE

During sample recirculation, an increase in activity may be observed on RU-26, on RU-158 CH-4 (Chemistry Sample Room), and on RU-155 CH-3 (77' West Penetration Room). Samples in Units 2 and 3, with the exception of Containment atmosphere, recirculate coolant immediately from the 77' elevation West Penetration Room to the Chemistry Primary Sample Room. Containment atmosphere samples are first recirculated locally to the 77' elevation West Penetration Room and then are directed to the Chemistry Primary Sample Room in a recirculation phase. In Unit 1, all samples progress through local recirculation before they are directed to the Chemistry Primary Sample Room.

3.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Technician, and the OSC Coordinator that PASS is in sample recirculation.

3.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

3.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

3.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

3.1.6.1 Special concern should be placed on streaming from the septum ports, approximately 6 inches from the floor, and directly in front of the sample sink.

3.1.6.2 Ask the Chemistry Technician which septum port is appropriate prior to entering the sample room.

3.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing.

3.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document.

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 0.5 ml of sample.

Analysis to be Done	Volume Needed	IAW
Gamma Isotopic	0.1 ml	74CH-9XC50
B	0.3 ml	74CH-9ZZ06
Cl	0.1 ml	74CH-9ZZ72

3.1.6.5 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines.

- Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

3.1.6.6 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

3.1.6.7 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

3.1.6.8 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

3.2 Collecting the sample

NOTE

A 1-ml liquid syringe of primary coolant, collected 2 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 780 REM / minute contact, and will decrease to 80 REM / minute at 6 cm (2.4 inches).

The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

3.2.1 Using the equipment previously staged on Chemistry Carts #1 and #2, place a 3½-ml liquid vial into the 2-inch thick lead pig.

3.2.2 Position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

3.2.3 Using the remote tool, place the syringe into the liquid sample port guide tube assembly.

3.2.4 Quickly and carefully, withdraw the desired sample volume into the syringe.

3.2.5 Remove the syringe from the sample port and carefully dispense the entire volume into the 3½-ml vial contained in the lead pig.

3.2.6 Place the empty syringe into the temporary syringe disposal cask with the point of the needle down.

3.2.7 (The RP Technician shall) take the dose rate reading at the top of the vial prior to dilution. This reading will be used for subsequent dilution calculations.

3.2.8 Prepare one piece of parafilm measuring 2-inch by 2-inch. Do not remove the backing paper from the piece of parafilm.

3.2.9 Place the piece of parafilm with the backing paper facing down over the vial containing the sample.

3.2.10 Install and latch the lead pig lid and move to a low dose area, as required.

3.2.11 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0 of this document, Sample Transportation. Otherwise, continue in this Section.

3.2.12 Monitor the background dose from the cart when working on dilution activities for isotopic analysis to ensure that Chemistry Count Room operations are not affected..

3.2.13 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

3.2.14 Unlatch and remove the lid from the lead pig containing the sample.

3.2.15 Using two tongs approximately 10 inches long, remove the parafilm and paper backing from the top of the 3½-ml vial. Ensure that the vial is not pulled out of the lead pig by the parafilm.

3.2.16 Ensure that the sample vial remains within the shielded portion of the lead pig for the maximum possible time.

3.2.17 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

3.2.18 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

3.3 Preparing for sample analysis

3.3.1 Ensure that the modified lead brick containing three vials is on cart #1 with their vial lids removed.

3.3.2 Ensure that no other contributing dose rate source is on cart #1.

3.3.3 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

3.3.3.1 For Boron Analysis, go to section 3.4.

3.3.3.2 For Chloride Analysis, go to section 3.5.

3.3.3.3 For Gamma Isotopic Analysis, go to section 3.6.

3.3.3.4 For Oxygen Analysis, go to section 3.7.

3.3.4 Using a pipette, withdraw an appropriate volume of liquid for each analysis required from the sample vial contained in the lead pig.

3.4 Boron analysis

3.4.1 For Boron analysis, proceed to 74CH-9ZZ06, Boron Autotitrator Operation and Calibration, using an RP Technician to provide radiological controls and support coverage. Return to this step when completed.

3.4.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.5 Chloride analysis

3.5.1 For Chloride analysis, proceed to 74CH-9ZZ72, Operation and Calibration of the Ion Chromatograph, using an RP Technician to provide radiological controls and support coverage. (Return to this step when completed.)

3.5.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.6 Gamma isotopic analysis

3.6.1 Dispense each volume of sample into one of the 7-ml vials contained in the modified 3-stage lead brick. Identify each vial if more than one is to be used.

3.6.2 Move cart #2 to an area away from cart #1 to minimize the dose rate. Relocate cart #2 to an area which will not affect Count Room operations.

3.6.3 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

3.6.4 Using the following equation, calculate activity (A):

$$A = (RV / G) \times 1000$$

where:

A = total sample activity in mCi (milliCuries)

R = sample dose rate reading at the top of the vial in R/hr (obtained by RP Technician in the preceding step)

V = sample volume in ml (normally 0.1 ml)

G = applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0 of this document, Sample Data Reference

1000 = conversion factor from Ci to mCi

Calculated activity: ______________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

3.6.5 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

3.6.6 After using pipettes to transfer the desired sample volume from one vial to another, use a 10-ml (B-D) syringe with a 1½-inch needle to dilute the sample to a total volume of 7 ml with D.I. water.

3.6.7 When the final dilution is complete, replace the screw cap on the vial to be counted and wrap the vial with parafilm, plastic wrap, or a plastic bag.

3.6.8 Prepare and attach clear identification information to the sample vial.

3.6.9 If dilutions were completed for the remaining dilution vials, cap them and attach clear identification information to them.

3.6.10 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

3.6.11 (The RP Technician will) record the dose rate reading(s) on a survey map and post / label the sample accordingly.

3.6.12 (The Chemistry Technician should) review the planned movement and use of the sample to allow the RP Technician to prepare the necessary area postings and contamination controls.

3.6.13 Place the 7-ml sample vial to be counted into a 1-inch lead carrying case and carry the sample to the sample counting room.

3.6.14 (The RP Technician will) post the Count Room area and prepare contamination controls as sample activity warrants.

3.6.15 (The Chemistry Technician should) review planned activities / work.

3.6.16 Using two 1-inch attenuator blocks for liquid isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per the PASS Liquid Sample Dilution Requirements in Section 9 of this document, Sample Data Reference.

3.6.17 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

3.6.18 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

3.6.19 Proceed to section 6.0, sample analysis follow-up.

3.7 Oxygen analysis

NOTE

Dissolved Oxygen for post-accident conditions will be determined by calculating the amount of Oxygen introduced into the system from either the borated water source (RWT) or the Containment atmosphere. Any Oxygen depletion due to Hydrogen scavenging or other means will be ignored. Henry's Law Constants were taken from EPRI, PWR Primary Water Chemistry Guidelines, Revision 2, and Lange's Handbook of Chemistry, 12th Edition. Oxygen (cc/kg) is converted to Oxygen (ppm) in the ratio: ppm (0.7) = cc/kg.

3.7.1 For Small Break LOCA (pre-RAS), perform the following:

Determine RCS Oxygen concentration (Cf) using the following equation:

$$Cf = \left[\frac{\left[\frac{(Prwt) \times 0.209 \times 1.43}{H}\right] \times [Vrwt] \times CI \times VI}{Vf}\right]$$

where:

Cf = Final RCS oxygen concentration, ppm

Prwt = RWT pressure, psia

0.209 = Conversion factor for partial pressure of oxygen exerted on RWT (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

Vrwt = Volume of RWT added to system, gallons

CI = Initial concentration of RCS Oxygen, ppm

VI = Initial volume of RCS, gallons (maximum RCS volume = 100,000 gallons)

Vf = Final combined volume, gallons (maximum RCS volume = 100,000 gallons)

H = Henry's Law Constant, kg-psia/cc (from table below)

RWT Temperature *(°F)*	kg-psia / cc
Trwt = 75	0.51
Trwt = 100	0.62
Trwt = 150	0.78
Trwt = 200	0.86

3.7.2 For Large Break LOCA (RAS), perform the following:

Determine RCS Oxygen concentration using the following equation:

$$\text{Crcs} = \left[\frac{\text{Pctmt} \times 0.209 \times 1.43}{\text{H}}\right]$$

where:

Crcs = Concentration of Oxygen in RCS (ppm)

Pctmt = Containment pressure, psia

0.209 = Conversion factor for partial pressure of Oxygen in Containment (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

H = Henry's Law Constant, kg-psia/cc (from table below)

RCS Temperature *(°F)*	kg-psia / cc
T_{RCS} = 75	0.51
T_{RCS} = 100	0.62
T_{RCS} = 150	0.78
T_{RCS} = 200	0.86

4.0 PASS pressurized liquid (gas) / containment air sampling

4.1 Preparing for Sample Collection

4.1.1 Place the temporary syringe disposal shield inside the sample room.

4.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

4.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Tech-nician, and the OSC Coordinator that PASS is in sample recirculation.

4.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

4.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

4.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

4.1.6.1 Special concern should be placed on streaming from the septum ports located at the front of the sample sink approximately 6 inches from the floor and at the left side of the sample sink approximately 18 inches from the floor.

4.1.6.2 Ask the Chemistry Technician which septum port is appropriate for the intended sample prior to entering the sample room

4.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing

4.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 2 samples.

Analysis to be Done	Volume Needed
H2 / O2	0.5 cc
Gamma Isotopic	0.1 cc

4.1.7 (The Chemistry Technician shall) inform the RP Technician of the number and volume of samples required.

4.1.8 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines. Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

4.1.9 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

4.1.10 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

4.1.11 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

4.2 Collecting the sample

CAUTION

A 0.5 cc syringe of RCS gas, collected 3 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 330 REM / minute contact, and will decrease to 27 REM / minute at 6 cm (2.4 inches). The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

4.2.1 With the equipment previously staged on Chemistry Carts #1 and #2, position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

4.2.2 Insert the gas-tight syringe into the handling tool and adjust the tool to withdraw the desired amount.

4.2.3 Using the syringe handling tool, place the syringe into the port guide tube assembly and withdraw the desired sample volume into the syringe.

4.2.4 (The Chemistry Technician will) place the syringe handling tool containing the syringe on the sample cart and then retreat to a designated low dose area.

4.2.5 (The RP Technician shall) take the dose rate reading on the syringe to establish initial working conditions.

4.2.6 If the sample is to be transferred to an Unaffected Unit, (the Chemistry Technician will) lock the syringe using the remote syringe locking tool.

4.2.7 (The Chemistry Technician will) place the syringe handling tool containing the syringe in the syringe carrying case.

4.2.8 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

4.2.9 Relocate the sample cart with the sample to an area of known background readings for the required analysis. Ensure that the area selected will not affect Count Room operations due to an unshielded source.

4.2.10 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

4.2.11 Ensure that the sample remains shielded for the maximum possible time.

4.2.12 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

4.2.13 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

4.3 Preparing for sample analysis

4.3.1 Ensure that all analyses activities are performed in accordance with Chemistry procedures and that the RP Technician is available to provide radiological controls and coverage.

4.3.2 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

4.3.2.1 For Hydrogen and Oxygen Analyses, go to section 4.4.

4.3.2.2 For Gamma Isotopic Analysis, go to section 4.5.

4.4 Hydrogen and Oxygen analyses

4.4.1 For Hydrogen and Oxygen analyses, transport 0.5 cc of sample to the gas chromatograph and analyze the sample in accordance with 74CH-9XC40, Operation and Calibration of the Hewlett Packard Gas Chromatograph. Return to this step when completed.

4.4.2 Proceed to section 6.0, sample analysis follow-up.

4.5 Gamma Isotopic analysis

4.5.1 For Gamma Isotopic analysis, transport 0.1 cc of sample to the sample preparation area and dispense the sample volume into a 9.2 cc gas vial (the vial previously evacuated 0.1 cc) contained in the modified lead bricks. The sample is now shielded.

4.5.2 Dispose of the syringe into the syringe disposal cask, needle down.

4.5.3 Move cart #2 to an area away from cart #1 to minimize the working dose.

4.5.4 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

4.5.5 Using the following equation, calculate activity (A):

$$A = (RV / G) \times 1000$$

where:

A = Total sample activity in mCi (milliCuries)

R = Sample dose rate reading at the top of the vial in REM/hr (obtained by RP Technician in the preceding step)

V = Sample volume in ml (normally 0.1 ml)

G = Applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0, Sample Data Reference

1000 = Conversion factor from Ci to mCi

Calculated activity: ______________________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

4.5.6 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

4.5.7 Perform the appropriate dilution by evacuating the specified amount from a clean 9.2 cc gas vial and injecting the sample.

4.5.8 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

4.5.9 (The RP Technician will) record the dose rate reading(s) and post / label the sample accordingly.

4.5.10 Place the final sample into a 1-inch shield and transport the sample to the sample counting room.

4.5.11 Using two 1-inch attenuator blocks for gas isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per section 9.0 of this document, Sample Data Reference.

4.5.12 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

4.5.13 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

4.5.14 Proceed to section 6.0 in this document, Sample Analysis Follow-up.

5.0 RU-144 / RU-146 High Range sampling

5.1 Preparing resources

5.1.1 "Mn" is the designator used for a Bechtel RU monitor number (e.g., Monitor-30 correlates to RU-144, Monitor-49 correlates to RU-146). "C" is the designator for the Channel Number or sample chamber, as appropriate.

5.1.2 RU-144 / RU-146 have two particulate / Iodine continuous (default) collection chambers and a third grab sample chamber, which has precisely timed collection capabilities. These are identified as 1, 2, and 3 from left to right when facing the chamber collection trays. The timed grab sample chamber is #3.

5.1.3 2 sample choices exist:

5.1.3.1 Either one of the two continuous channels may be collected after placing the alternate channel into operation, or...

5.1.3.2 A timed grab sample may be taken (low volume) in conditions of high Iodine activity

5.1.4 The instructions in this Section should be performed by the Radiological Monitoring Technician and pertain only to RU-144 and RU-146 particulate and Iodine samples. All other samples should be obtained in accordance with 74RM-9EF60, RMS Sample Collection.

5.1.5 Access to either monitor requires established radio communications with Technical Support Center personnel or with those designated per the team briefing. The RP Technician shall ensure that radio communications are maintained.

CAUTION

Exposure rates may be extremely high when attempting to obtain samples from an effluent monitor under accident conditions - both at the skid and enroute. All ingress / egress paths should be evaluated to minimize potential dose. The instructions herein may be performed out-of-sequence for ALARA considerations. Sample dose rates will be dependent on sample flow rates and Iodine activity levels. Form EP-0055, RMS Skid Collection Time Calculation (see Appendix C - Forms), may be used to determine the collection time in high Iodine activity situations to maintain sample dose rates below the 0.25 Ci sample counting limit.

5.1.6 (The RP Technician shall) ensure that the Radiological Protection Coordinator (RPC) in the Technical Support Center (TSC), or designee, will monitor plant and RMS conditions and provide them to the sampling team via radio, as appropriate.

5.1.7 Use Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as required, to log information accumulated during performance of these instructions.

NOTE

The filter head, a stainless steel head specifically designed for the RMS, and the required sample handling tools / tongs, are located in the OSC Emergency Kit.

5.1.8 Prepare all equipment associated with Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

5.1.9 If RU-146 sampling is to be performed, ensure that a bucket with at least 50' of rope is included with the equipment.

5.1.10 Load the filter head with a Silver Zeolite (AgX) Cartridge and particulate filter.

5.1.11 Determine the sample to prepare and proceed to the appropriate sample preparation block per the following:

5.1.11.1 To prepare a continuous collection sample from RU-144, go to section 5.2.

5.1.11.2 To prepare a timed grab sample from RU-144, go to section 5.3.

5.1.11.3 To prepare a continuous collection sample from RU-146, go to section 5.4.

5.1.11.4 To prepare a timed grab sample from RU-146, go to section 5.5.

5.2 RU-144 Continuous Collection Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.2.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.2.2 Change the sample chamber by first placing the DCU into "Privileged" Mode and then typing DCC 30 3 (1 or 2) and pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 15 (1 or 2) ENT.)

5.2.3 Proceed to section 5.6.

5.3 RU-144 Timed Grab Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are reestablished with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.3.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.3.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.3.3 Set the grab sample duration by first typing GSD 30 3 (sample duration in seconds) and then pressing <RETURN>. [Example: 90 seconds is entered as "9.00 01 ENT"] (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 16 (sample duration in seconds) ENT. Verify by typing DSP 3 16 ENT.)

5.3.4 Initiate the grab sample by first typing IGS 30 3 and then pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter FTN 3 02 ENT.)

5.3.5 Allow sample collection to complete before continuing. The RP Technician can use this time period to establish a Cold Area for the team.

5.3.6 Proceed to section 5.6.

5.4 RU-146 Continuous Collection Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.4.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. (At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.)

5.4.2 Change the sample chamber by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 15 (1 or 2) ENT.

5.4.3 Proceed to section 5.6.

5.5 RU-146 Timed Grab Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.5.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.5.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.5.3 Set the grab sample duration by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 16 (sample duration in seconds) ENT. [Example: 90 seconds is entered as "9.00 01 ENT"]. Verify by typing DSP 3 16 ENT.

5.5.4 Initiate the grab sample by first placing the keyswitch in "ENABLE/LOCAL" and then entering FTN 3 02 ENT.

5.5.5 Allow sample collection to complete before continuing. (The RP Tech-nician can use this time period to establish a Cold Area for the team.)

5.5.6 Proceed to section 5.6.

5.6 High Range Collection

NOTE

RMS skid sampling may require passage through and/or working in general areas accompanied by high and varying dose rates. Constant attention must be given to background dose rates and expected high dose rates from the sample media. The travel route employed and sampling activities performed by Chemistry and RP should be acted and talked through prior to the actual sampling evolution.

5.6.1 With the necessary equipment, proceed to the monitor location.

5.6.2 Taking along that which is required, proceed to the monitor. If on location at RU-146, leave the lead pig with the lid open on the 140' elevation directly below the point from which the sample will be lowered. Carry the latch handle, handling tool, bucket, rope, and new filter head up the stairs to the monitor.

5.6.3 (The RP Technician shall) verify working dose rates at the monitor.

5.6.4 Ensure that the transfer pig lid is open and that the transfer pig is positioned for smooth and quick transfer of the sample. If on location at RU-146, tie one end of the rope to the bucket handle and the other end to the railing. Ensure that samples can be lowered without impairment.

5.6.5 Prior to isolating the sample flow valves, check the position of the solenoid valves to ensure that the channel has been isolated. The lamp above the active collection channel will be illuminated.

5.6.6 Close the inlet and outlet sample flow valves of the particulate / Iodine channel(s) as directed in the team briefing per the following chart:

P/I Chamber #1		P/I Chamber #2		P/I Chamber #3	
IN	OUT	IN	OUT	IN	OUT
HCV-02	HCV-05	HCV-03	HCV-06	HCV-04	HCV-07

5.6.7 Open the shielded door by raising the latch.

5.6.8 (The RP Technician should) measure the dose rate on the P/I holder. If the dose rate exceeds the contact reading [REM / hr] as specified in the team briefing, the shield door should be closed and the sample left to decay prior to removal.

5.6.9 Insert the latch handle tool over the sample assembly lever and turn it counter-clockwise to release the spring tension. (This step can be performed manually as dose rates permit.)

5.6.10 Remove the Iodine and particulate sample filter head from the assembly quickly and carefully using tongs or manually as dose rates permit.

5.6.11 (The RP Technician should) obtain 1-foot dose rate readings on the sample filter head.

5.6.12 Place the sample filter head in the lead transfer pig and replace the lid. If on location at RU-146, place the sample filter head in the bucket and lower it to the 140' elevation at the pig.

5.6.13 Place the new filter head in the monitor sample assembly.

5.6.14 Turn the lever on the sample assembly clockwise using the latch handle or manually as dose rates permit.

5.6.15 Close and latch the shielded door and open the appropriate inlet and outlet valves previously closed.

5.6.16 Obtain total flow values.

5.6.17 If necessary, use the RMS key to place the microprocessor in "Local" or "Enable" Mode.

5.6.18 At the microprocessor, enter DSP C 37 ENT to display total flow in cubic feet, where "C" refers to 3 for continuous grab sample chamber #1, 4 for continuous grab sample chamber #2, or 5 for the timed grab sample chamber.

5.6.19 Record this value on Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as appropriate.

5.6.20 Step the filter and zero the flow totalizer and timer by performing the following actions:

5.6.20.1 Enter STP C ENT to step the filter. Use the number previously entered as "C."

5.6.20.2 Verify that the totalizer has been re-zeroed by entering DSP C 37 ENT. Use the number previously entered as "C."

5.6.21 Return the microprocessor to "Remote" or "Disable" Mode.

5.6.22 Press the "TEST-LT CK" Button to ensure that microprocessor communications are restored.

5.6.23 (If on location at RU-146, return to the 140' elevation and place the sample filter head in the transfer pig and replace the lid.)

5.6.24 (The RP Technician will) contact the OSC Coordinator and (the Radiological Monitoring Technician will) contact the Chemistry Coordinator and relay that the filters have been changed.

5.6.25 Deliver the sample to the appropriate Counting Room.

5.6.26 (The RP Technician will) label and shield (or store), as designated, the sample to minimize background activity..

5.6.27 (The Radiological Monitoring Technician will) ensure that all necessary data is attached.

5.6.28 If the sample is to be transferred to an Unaffected Unit for counting, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

5.7 High Range Skid Sample Analysis

CAUTION

Contact dose rate readings on the particulate and Iodine assembly may be greater than 9.0 REM / hour. Maintain adequate distances, minimize time periods in proximity, and maximize the use of shielding to ensure that personnel doses during sample analyses are maintained ALARA.

5.7.1 Using the P/I radiation level at a distance of 1 foot from the P/I cartridge, (readings obtained previously or at this time with the pig lid removed), determine the best method to obtain an estimate of isotopic Iodine levels.

NOTE

Counting systems in the laboratory are restricted to approximately 0.25 Ci in the sample due to avalanche and Compton scatter of the sample.

5.7.2 If dose rates are > 0.8 REM / hour, perform the following actions:

5.7.2.1 Using section 9.0, Sample Data Reference, RMS P/I Dose Rate - Curie Conversion Factors, obtain the appropriate net dose rate Curie conversion factors for I131 through I135, according to the time elapsed from the time of the accident to the time of the sample.

5.7.2.2 Calculate the estimated Curie content using the following formula:

AI = R X G

where:

AI = Individual isotopic activity in Curies

R = Unshielded sample dose rate reading at 1 foot in REM / hour

G = Individual isotopic conversion factor for I131 through I135 from RMS P/I Dose Rate - Curie Conversion Factors in section 9.0, Sample Data Reference

5.7.2.3 Calculate the effluent Iodine concentrations using the following formula:

$$Ci = \frac{35.3 \times Ai}{V \times 0.04}$$

where:

Ci = Iodine concentration of isotope "I," µCi/cc

V = Sample volume, cubic feet

35.3 = Conversion factor, µCi - ft3 / Ci - cc

0.04 = Plate-out correction factor for RU-144 / RU-146 skid samples

5.7.2.4 Calculate the total Iodine concentration by summing the isotopic concentrations.

5.7.2.5 Proceed to section 6.0, Sample Analysis Follow-up.

5.7.3 If dose rates are less than or equal to 0.8 REM / hour, perform the following actions:

5.7.3.1 Using six 1-inch attenuator blocks initially, carefully and quickly place the sample filter head assembly in the lead shield in the sample holder rack at the highest elevation centered directly over the appropriate attenuator block. Remove blocks as necessary.

5.7.3.2 Perform sample analysis in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System. Multiply the sample volume by 0.04 Iodine plate-out correction factor.

5.7.3.3 Remove the sample from the lead shield quickly and carefully using tongs and place the sample in a lead cask / pig.

5.7.3.4 Proceed to section 6.0, Sample Analysis Follow-up.

6.0 Sample analysis follow-up

6.1 Control of Analyzed Samples

NOTE

Form EP-0514, Containment Radiochemistry CDA (Parts 1-11 - see Appendix C - Forms) can be used to facilitate transmittal of data to the Technical Support Center.

6.2 Report analytical results to the Chemistry Coordinator upon completion of sample analysis.

NOTE

As appropriate, it is recommended that the Boron sample be discarded to the Chemical Drain Tank to minimize handling of diluted and contaminated samples.

6.3 (The Chemistry Coordinator will) designate which samples are to be saved and which are to be discarded.

6.4 Analyzed samples designated to be saved shall be dose rated, labeled, and shielded (or stored) as specified by the RP Technician to minimize background activity.

7.0 Preplanned Alternate Sampling

CAUTION

Significant exposure potential exists for the steps in this Section if performed under fuel failure conditions. The PASS should be used in all such conditions, if available. Team briefing and preparation must be planned with additional detail under fuel failure conditions in accordance with the guidance in this Section.

The loss of the PASS unit will remove the built-in sample and recirculation path shielding provided by that system and the built-in control of airborne (gas) leakage.

Section 9.0, Sample Data Reference, PASS Dose Information / Thumb Rules, applies to use of the PASS unit only. Use of the alternate sampling path under failed fuel conditions implies operating under worst-case conditions. It is imperative that actions are based on those conditions rather than assumptions because of the potential for lethal dose areas to exist.

Dose rates in the primary sample sink area will mandate stay time controls for worst-case situations. It will be crucial to involve the RM Technician to provide full-time monitoring of RMS indications (dose rates and airborne levels) to assist the PASS team.

Airborne problems are minimized using PASS, but have the potential to be extreme when using the Preplanned Alternate Sampling methodology. Breathing protection (SCBA or supplied air) should, therefore, be used if practicable.

Analysis in the Affected Unit is highly doubtful when using the Preplanned Alternate Sampling methodology. Another Unaffected Unit laboratory should be prepared for sample analysis.

7.1 Review both Section 3.6 (specific information applicable to preplanned alternate sampling conditions and assumptions) and Appendices A and B of 74DP-9CY02, Post Accident Sampling Program.

7.2 Review Section 3 of 74OP-9SS05, Preplanned Alternate Sampling.

7.3 Clarify the planned sequence of actions with the sampling team and how these actions integrate with this procedure -- an example follows:

PASS is inoperable and an RCS liquid sample must be collected from the primary sample sink. The team would use part of Section 4 of 74OP-9SS05, Preplanned Alternate Sampling, to obtain a sample. They would then implement this procedure and perform Section 3.3, PASS Depressurized Liquid Sampling - Sample Analysis. (All actions should be acted and talked through during the briefing to ensure that a workable sequence of actions has been thoroughly formulated.)

7.4 Ensure all applicable actions relative to Appendix K - Emergency Exposures and KI have been addressed for the sample team.

7.5 Review the plant conditions with the sample team and the potential for fuel failure and its impacts.

7.6 Obtain the sample and analyze accordingly per the guidance disseminated in the team briefing.

8.0 Sample transportation

NOTE

Using the lead pig transfer rod, two individuals will be required to transport the lead pig containing the sample to an Unaffected Unit. The transfer rod should allow a 3-foot distance between each individual and the lead pig.

8.1 Onsite sample movement

8.1.1 (The RP Technician will) ensure that the sample is radiologically labeled and packaged, as appropriate, prior to transfer.

8.1.2 (The Chemistry Technician and Chemistry Coordinator will) determine the location to which the sample will be transferred.

8.1.3 (The Radiological Protection Coordinator and the RP Technician shall) determine the route based on current site conditions.

8.1.4 An Emergency REP and a team briefing shall be prepared, with all participating group personnel signed onto the REP prior to start of sample movement.

8.1.5 Advise the Security Director of the planned route of passage for Security escort and for the clearing of passageways in the receiving Unit, if appropriate.

8.1.6 Obtain an appropriate vehicle for transportation between Units as the activity and plant conditions warrant.

8.1.7 Prior to transfer, transmit copies of all applicable RP survey data and Chemistry information for the sample to the receiving Unit's RP and Chemistry Departments.

8.1.8 Prior to transfer, obtain acknowledgement of sample receipt preparations from the appropriate receiving Unit's department personnel.

8.1.9 Transfer the sample using planned resources, as necessary.

8.1.10 (Receiving Unit personnel will) assume continuation of performance in this procedure upon receipt of the transferred sample.

8.2 Offsite sample shipping

8.2.1 Labeling and shipping of samples will be performed by site personnel who are trained and qualified on applicable procedures in accordance with current site radwaste shipping and handling requirements.

9.0 Sample data reference

9.1 This information is based on PVNGS Calculation 03-NC-SS-A01, PASS Doses. The calculation is for a LOCA worst-case analysis and is based on the following assumptions:

9.1.1 Sampling is performed in the Affected Unit using the PASS.

9.1.2 Analysis is performed in an Unaffected Unit.

9.1.3 Dose traveling to and from the Affected Unit is not included (~2 REM TEDE).

9.1.4 Use is made of remote handling tools.

9.1.5 Source term data is from Bechtel Calculation 13-NC-CH-304, Post LOCA Sample Doses.

9.1.6 Airborne dose rates from Bechtel Calculation 13-NC-ZA-322, Post LOCA Airborne Dose for PASS, are negligible.

9.1.7 Dose given is for normal ventilation operable and for loss of power conditions (i.e., loss of ventilation).

9.1.8 Extremity dose "EX" is SDE to the extremities.

Dose in REM	RCS Liquid	RCS Gas	CTMT Air	RCS Liquid w/ LOP	RCS Gas w/ LOP	CTMT Air w/ LOP
Preparation	0.36 DDE	0.37 DDE	0.37 DDE	1.32 DDE	1.75 DDE	1.53 DDE
Sampling	0.12 DDE	0.10 DDE	0.09 DDE	0.80 DDE	0.66 DDE	0.47 DDE
Dilutions	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX
Analysis	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX
TOTALS	0.53 DDE	0.47 DDE	0.46 DDE	2.20 DDE	2.40 DDE	2.00 DDE

Sample Type	Sample Quantity (cc or ml)	mrem / Hour @ 18"
RCS Liquid	0.1	425
	0.3	1270
	0.8	3400
RCS Gas	0.1	68
	0.5	340
Containment Atmosphere	0.1	2
	0.5	9

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

RCS LIQUID SUMMARY

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
0	450	1.5720	286.9
1	290	1.1723	248.9
4	150	0.8106	188.0
8	105	0.6441	163.4
12	84	0.5481	151.6
24	52	0.3912	132.8
48	30	0.2626	115.9
72	22	0.2051	107.4
168	12	0.1232	96.8
252	8.9	0.0923	95.9

RCS GAS SUMMARY			
0	430	1.4696	295.3
1	280	1.0949	256.2
4	140	0.7438	192.2
8	96	0.5799	166.0
12	74	0.4855	153.3
24	44	0.3329	132.3
48	24	0.2105	112.5
72	16	0.1577	102.0
168	7.8	0.0869	89.2
252	5.4	0.0611	88.4

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

CONTAINMENT ATMOSPHERE SUMMARY

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
0	4.30	0.0170	249.770
1	1.20	0.0074	163.230
4	0.45	0.0050	89.670
8	0.25	0.0041	59.654
12	0.18	0.0037	47.760
24	0.11	0.0031	36.496
48	0.08	0.0025	31.960
72	0.07	0.0022	30.775
168	0.04	0.0012	30.240
252	0.02	0.0008	30.603
SI SUMMARY			
0	110	0.3657	290.970
1	69	0.2732	252.510
4	36	0.1874	190.200
8	24	0.1476	164.960
12	19	0.1247	152.720
24	12	0.0874	133.010
48	6.6	0.0571	114.920
72	4.6	0.0438	105.670
168	2.4	0.0254	94.245
252	1.7	0.0186	93.381

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

PASS LIQUID SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	70	0.1	14.29	4900	0.5	1.02	68600
0.1	900	70	0.1	12.66	4900	0.5	0.92	68600
0.1	800	70	0.1	11.43	4900	0.5	0.82	68600
0.1	700	70	0.1	10.00	4900	0.5	0.71	68600
0.1	600	70	0.1	8.57	4900	1.0	1.22	34300
0.1	500	70	0.1	7.14	4900	1.0	1.02	34300
0.1	400	70	0.1	5.51	4900	1.0	0.82	34300
0.1	300	70	0.1	4.29	4900	1.0	0.61	34300
0.1	200	70	0.1	2.86	4900	2.0	0.82	17150
0.1	100	70	0.1	1.43	4900	2.0	0.41	17150
0.1	90	70	0.1	1.29	4900			
0.1	80	70	0.1	1.14	4900			
0.1	70	70	0.1	1.00	4900			
0.1	60	70	0.1	0.86	4900			
0.1	50	70	0.1	0.71	4900			
0.1	40	70	0.2	1.14	2450			
0.1	30	70	0.2	0.86	2450			
0.1	20	70	0.3	0.86	1633			
0.1	10	70	0.5	0.71	980			
0.1	9	70	0.5	0.64	980			
0.1	8	70	0.5	0.57	980			
0.1	7	70	0.5	0.50	980			
0.1	6	70	0.5	0.43	980			
0.1	5	70	0.5	0.36	980			
0.1	4	70	0.5	0.28	980			
0.1	3	70	0.5	0.22	980			
0.1	2	70	0.5	0.14	980			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 7 ml and C2 = 1.4 mCi

PASS GAS SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	92	0.1	10.87	8464	0.5	0.59	155738
0.1	900	92	0.1	9.78	8464	0.5	0.53	155738
0.1	800	92	0.1	8.70	8464	0.5	0.47	155738
0.1	700	92	0.1	7.61	8464	0.5	0.41	155738
0.1	600	92	0.1	6.52	8464	1.0	0.71	77869
0.1	500	92	0.1	5.43	8464	1.0	0.59	77869
0.1	400	92	0.1	4.35	8464	1.0	0.47	77869
0.1	300	92	0.1	3.26	8464	1.0	0.35	77869
0.1	200	92	0.1	2.17	8464	2.0	0.47	38934
0.1	100	92	0.1	1.09	8464	2.0	0.24	38934
0.1	90	92	0.1	0.98	8464			
0.1	80	92	0.1	0.87	4232			
0.1	70	92	0.1	0.76	4232			
0.1	60	92	0.1	0.65	2821			
0.1	50	92	0.1	0.54	1693			
0.1	40	92	0.2	0.87	1693			
0.1	30	92	0.2	0.65	1693			
0.1	20	92	0.3	0.65	1693			
0.1	10	92	0.5	0.54	1693			
0.1	9	92	0.5	0.49	1693			
0.1	8	92	0.5	0.44	1693			
0.1	7	92	0.5	0.38	1693			
0.1	6	92	0.5	0.32	1693			
0.1	5	92	0.5	0.27	1693			
0.1	4	92	0.5	0.21	1691			
0.1	3	92	0.5	0.16	1693			
0.1	2	92	0.5	0.11	1693			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 9.2cc and C2 = 1.4 mCi

RMS P/I DOSE RATE - CURIE CONVERSION FACTORS					
Time After	I^{131}("G")	I^{132}("G")	I^{133}("G")	I^{134}("G")	I^{135}("G")
Accident *(hours)*	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr
0	1.20E-02	1.30E-02	2.60E-02	2.80E-02	2.40E-02
1	1.20E-02	9.30E-03	2.40E-02	1.30E-02	2.20E-02
2	9.40E-03	5.40E-03	1.80E-02	4.40E-03	1.50E-02
3	2.40E-02	1.00E-02	4.50E-02	5.10E-03	3.50E-02
4	2.90E-02	9.00E-03	5.30E-02	2.80E-03	3.80E-02
5	3.40E-02	7.80E-03	6.00E-02	1.50E-03	4.00E-02
6	3.80E-02	6.40E-03	6.50E-02	6.80E-04	4.10E-02
7	4.20E-02	5.30E-03	7.10E-02	3.80E-04	4.10E-02
8	4.60E-02	4.50E-03	7.50E-02	2.10E-05	4.00E-02
9	5.00E-02	3.60E-03	7.90E-02	9.00E-05	8.10E-03
10	5.40E-02	2.90E-03	8.30E-02	4.90E-05	3.90E-02
11	5.90E-02	2.10E-03	8.70E-02	2.10E-05	3.80E-02
12	6.20E-02	1.70E-03	8.90E-02	1.10E-06	3.60E-02
13	6.60E-02	1.20E-03	9.20E-02	5.40E-06	3.50E-02
14	7.00E-02	1.30E-03	9.50E-02	2.60E-06	3.30E-02
15	7.40E-02	6.80E-04	9.70E-02	1.40E-06	3.20E-02
16	7.90E-02	7.20E-04	1.00E-01	5.80E-07	3.00E-02
17	8.20E-02	5.30E-04	1.00E-01	3.00E-07	2.90E-02
18	8.60E-02	4.00E-04	1.00E-01	1.60E-07	2.70E-02
19	9.00E-02	3.40E-04	1.00E-01	6.70E-08	2.60E-02
20	9.40E-02	2.60E-04	1.10E-01	2.60E-08	2.50E-02
21	9.80E-02	1.80E-04	1.10E-01	1.80E-08	2.30E-02
22	1.00E-01	1.90E-04	1.10E-01	6.70E-09	2.10E-02
23	1.10E-01	1.00E-04	1.10E-01	3.00E-09	2.00E-02
24	1.10E-01	9.30E-05	1.10E-01	1.00E-09	1.90E-03
24 - 48	1.60E-01	3.10E-06	1.10E-01	1.60E-13	7.80E-03
48 - 72	2.40E-01	4.40E-09	8.20E-02	1.60E-21	1.10E-03
72 - 96	3.00E-01	4.30E-12	5.00E-02	1.30E-29	1.20E-04
96 - 120	3.40E-01	3.70E-15	2.60E-02	9.10E-38	1.20E-05

__NOTE__: P/I exposure rate is calculated assuming that the measurement is taken 1 foot from the P/I cartridge. These conversion factors are independent of the distance that the radiation measurement is taken.

Appendix M - Ultimate Heat Sink considerations

1.0 Ultimate Heat Sink considerations

For an alternate source of Spray Pond inventory, direct Maintenance and Engineering to implement actions necessary to restore Spray Pond inventory, with particular respect to the following items:

1.1 Ensure that these actions are initiated within 6 days following a seismic event/SSE that results in irreparable damage to the 3 onsite wells which supply makeup water to the spray pond.

1.2 Secure a dependable water supply capable of delivering 1200 gpm within 21 days of an SSE or other accident which eliminates or restricts normal water supply to an inadequate level.

1.3 Ensure that the Environmental Department files a Notice of Intent to Drill with the Arizona Department of Water Resources before new well drilling commences.

1.4 Ensure that, as soon as practical, the Environmental Department applies for a temporary permit to withdraw groundwater in excess of our grandfathered right by submitting evidence that an emergency exists to the Director of the Arizona Department of Water Resources.

1.5 Ensure that Spare Well Water Pump (MLIS ID #45750074) and 200 HP, 3-phase, 1800 rpm Electric Motor (MLIS ID #44670001) have been adequately maintained under PM Task 054390.

1.6 Ensure an accurate assessment of current water inventory, normal water supply system status, time estimates for restoration of normal systems, identification of alternate supplies, and technically sound solutions to any outstanding water supply problems.

1.7 Ensure that a well drilling company capable of constructing a well within 15 days is mobilized.

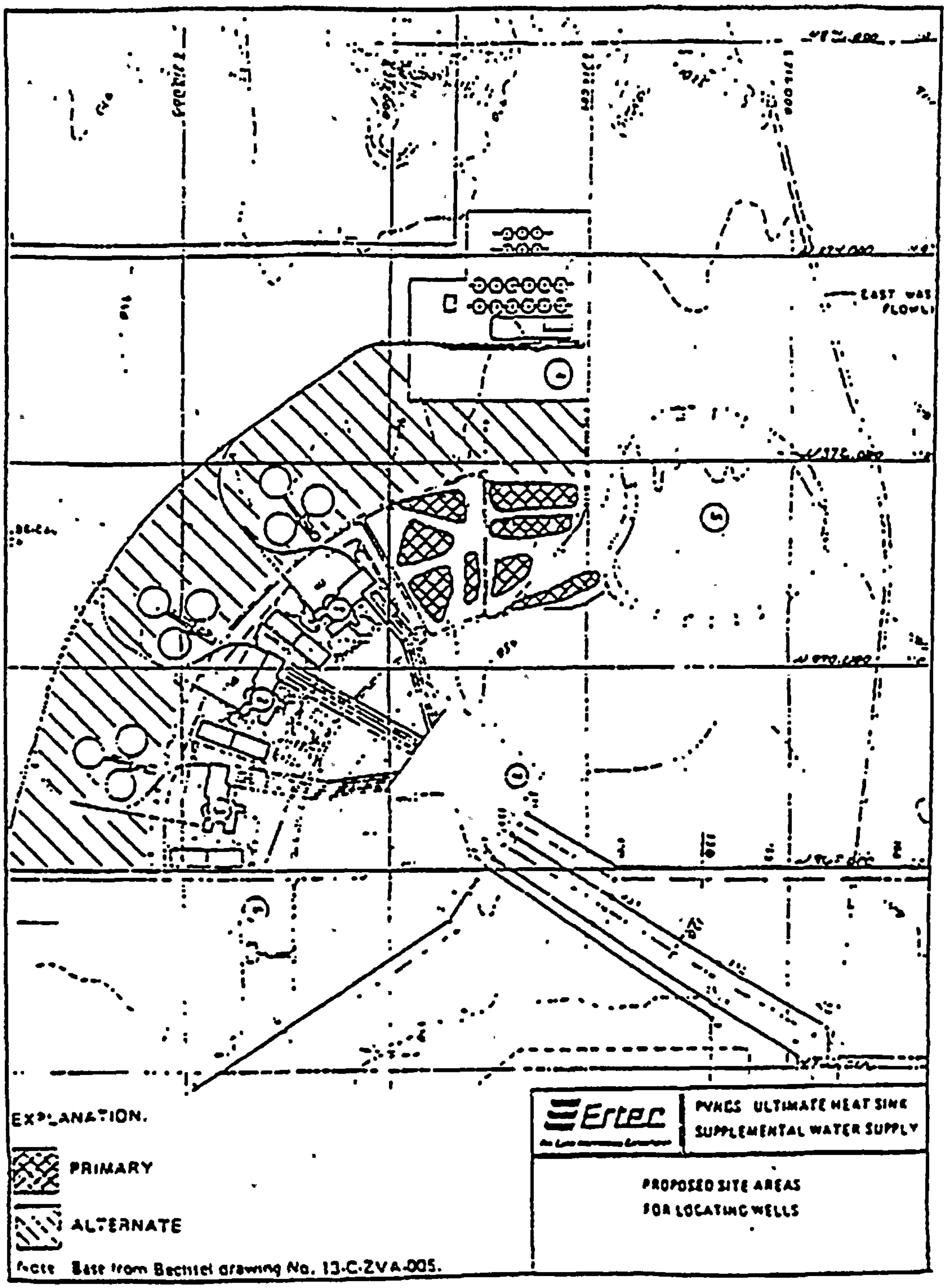
1.8 Ensure that a supply company capable of delivering temporary piping is mobilized.

1.9 Identify alternate routes to the site from Phoenix or possible equipment air lifts.

1.10 Determine the extent of damage to the 2 normal production wells 34abb and 27ddc and the standby well 27cbc with work initiated to restore the normal production wells and the standby well to service.

1.11 Reference the ERTEC drawing on the next page for well site selections.

2.0 Ertec Drawing



Appendix N - EOF Diesel Generator Operations

1.0 EOF diesel generator startup

1.1 On loss of power to the EOF, verify that both normal (1E-NAN-S06 source) and emergency (1E-NAN-S05) AC power is not available, by communicating with the Control Room of an unaffected Unit (there should be an LOP or Trouble on both the 1E-NAN-S05 and S06 buses). If power is verified to be out and it has been decided not to evacuate to the Backup EOF, then continue with this procedure. EOF maps included after the procedure steps may be of assistance.

NOTE

Immediately notify the Administrative & Logistics Coordinator if any problems are encountered in the conduct of this procedure. It may become necessary to evacuate the EOF.

1.2 Verify installation of the 4/0 (minimum) ground conductor between the generator breaker box and the ground lug provided beneath receptacle AE-NZN-I01.

1.3 Verify installation of the secondary trailer ground conductor between the trailer frame (tongue end) and the grounding conductor of transformer A-E-NGN-L51X.

1.4 Verify installation of the generator power cable plug to receptacle AE-NZN-I01. The keyway in the plug receptacle assembly ensures proper circuit phasing is maintained. Secure the plug to the receptacle using the integral receptacle fasteners.

CAUTION

The following step is critical to personnel safety and equipment protection. THIS STEP SHALL BE COMPLETED PRIOR TO THE APPLICATION OF GENERATOR POWER. This action isolates AEZYNDOX20 (PDP-E) panel loads from the building electrical distribution system, allowing alignment to the diesel generator.

1.5 With concurrent verification, at panel A-E-NZN-D0X-08 (EDP), open the circuit breaker marked "PDP-E MAIN BKR AEZYNDOX20" - "Main Panel PDPE" (this is the bottom breaker in this panel). All other breakers in this panel are to remain closed.

1.6 With concurrent verification, open all circuit breakers at distribution panel AEZYNDOX20 (PDP-E).

1.7 With concurrent verification, unlock and close Safety Switch AE-NZN-U0X-02. [lock combination is 1796].

1.8 With concurrent verification, place the Safety Switch padlock upon door handle pin of panel A-E-NZN-D0X-08 (EDP) to secure and lock the door in the closed position.

1.9 Start the diesel generator as described below. The mechanical controls are located on the left side of the engine-generator trailer, on the engine itself.

NOTE

If the diesel will not start or run acceptably, notify the Administrative & Logistics Coordinator. It may be necessary to prepare to evacuate the EOF.

1.10 Locate the Engine Start switch. This switch is a push-to-turn, spring return to normal type, marked HEAT-OFF-START, that controls both the diesel glow plug pre-heating and the engine starter.

1.11 Push in, turn the switch to the left (CCW, to the HEAT position), and hold the switch in this position to preheat the diesel cylinders. Approximate preheat time requirements are described below:

Outside temperature	Pre-Heat Time
Above 60 degrees F	None
Below 60 degrees F to 32 degrees F	1 minute
Below 32 degrees F	2 minutes

1.12 Release the switch, then push-turn to the right (CW, to the START position) to start the engine. Release the switch when the engine commences to run.

1.13 Adjust the throttle (CW) adjacent to the starting switch as required to bring the engine to running speed, as indicated by the Voltage (490-500 VAC) and Frequency (61-63 Hz) Meters on the Generator Output Breaker Control Panel. This panel is located on the rear right side of the engine-generator trailer.

1.14 If radiological conditions permit, allow two minutes of unloaded run time before closing the generator output breaker and loading the generator.

1.15 With concurrent verification, close the generator AC output breaker (open the electrical box and push the breaker handle upward).

1.16 With concurrent verification, at Distribution Panel AEZYND0X20 (PDP-E), close the following breakers: Air Compressor CHC-1, Air Handler AO-1, Filter RFU-1, LPB Panel EOF, Mech. Equip. Rm Exhaust Fan EF-11, Pump No. 5 P-5, Chiller No. 2 C-2.

2.0 EOF HVAC system restart

NOTE

These steps assume that the EOF ventilation system is operating in the filtration mode and the cooling tower CT-1 is operating or available.

2.1 With concurrent verification, locate the Cooling Tower CT-1 Filter Isolation Valves V103 and V104. Verify they are in the open position (with handles parallel to the piping).

2.2 With concurrent verification, at Cooling Tower Control Panel AJZYNE05, verify the selector switch to (or set it to) position CT-1.

2.3 With concurrent verification, at Panel AEZYND0X20 (PDP-E) close the circuit breakers for pump P-2 and cooling tower CT-1.

2.4 With concurrent verification, at the control panel on Main Chiller #1, AMZYNE0X1, press the selector (rocker type) switch to STOP/RESET.

2.5 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

2.6 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

2.7 Check generator voltage and frequency at Control Panel; adjust throttle as required to maintain frequency above 60 Hz.

2.8 Return to EOF and report to Administrative and Logistics Coordinator that power has been restored.

2.9 OPTIONAL - Operational performance of the Air Handling Unit AEZYNA0X01 can be determined by observing the temperature differential between temperature indicators TI-0024 (chilled water return) and TI0025 (chilled water supply). After 5 minutes of chiller operation, the temperature of TI-0024 should be greater than TI-0025. The thermometer-type temperature indicators are mounted at eye level on the respective chilled water lines indicated above. See the "Building Arrangement" sketch 2 of 2 in this procedure for their approximate physical location in the room.

3.0 Brown-out

In the event that a diesel generator overload condition is detected (generator output current approaching 300 Amperes, or if "brown-out" conditions are detected in the EOF, perform the following steps:

3.1 Obtain the master key from the key box in EOF room #7.

3.2 Inside the EOF pump room (Room #14 - left wall) locate distribution panel LPB (AEZYNDOX14), and open the panel. Open breakers #31 through 42. This sheds the EOF duct heaters from the generator load.

3.3 If necessary, locate panel RBA (AEZYNDOX12) inside the telephone equipment room on the left side of the EOF Command Center (left wall). Open breakers #24, 26, 28, and 30. The master key will also open the room door if locked.

3.4 Re-check the generator load current at the engine panel to confirm the load demand is within acceptable limits.

3.5 Return the master key to the key box in Room #7.

4.0 Brown-out restoration

To restore the original conditions before the load-shed was accomplished:

4.1 Obtain the master key from key box in EOF Room #7.

4.2 Locate distribution panel LPB; re-close breakers #31 through 42.

4.3 Locate distribution panel RBA; re-close breakers #24, 26, 28, and 30.

4.4 Return the master key to the key box in room #7.

5.0 Restoring normal power.

NOTE

If available, Electrical Maintenance may be requested to perform the power restoration described below.

5.1 Notify the Administrative & Logistics Coordinator before diesel shutdown and power restoration. A short duration power outage of the EOF is required to perform realignment of the feeder circuit.

5.2 Verify that offsite power is available and has remained stable for 15 minutes minimum, and that normal and/or emergency AC power is available at the transfer switch A-E-NZN-U0X-01.

5.3 With concurrent verification, open all circuit breakers on the distribution panel AEZYND0X20 (PDP-E).

CAUTION

The following step is critical to personnel safety and equipment protection. This step shall be completed prior to the restoration of normal power.

5.4 With concurrent verification, remove the lock from the door handle of panel A-E-NZN-D0X-08;

5.5 With concurrent verification, open and LOCK safety switch AE-NZN-U0X-02. This isolates the diesel generator from the building power distribution system.

5.6 With concurrent verification, in the EDP panel [A-E-NZN-D0X-08], close the breaker feeding the PDP-E panel. This breaker is located at the bottom of the EDP panel

5.7 With concurrent verification, close all the breakers in distribution panel AEZYND0X20 (PDP-E), including those of the elevator and the water heater.

5.8 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

5.9 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

6.0 Shutting down the diesel engine:

6.1 Confirm that the EOF has been reconnected to the normal/emergency source(s) of off-site power.

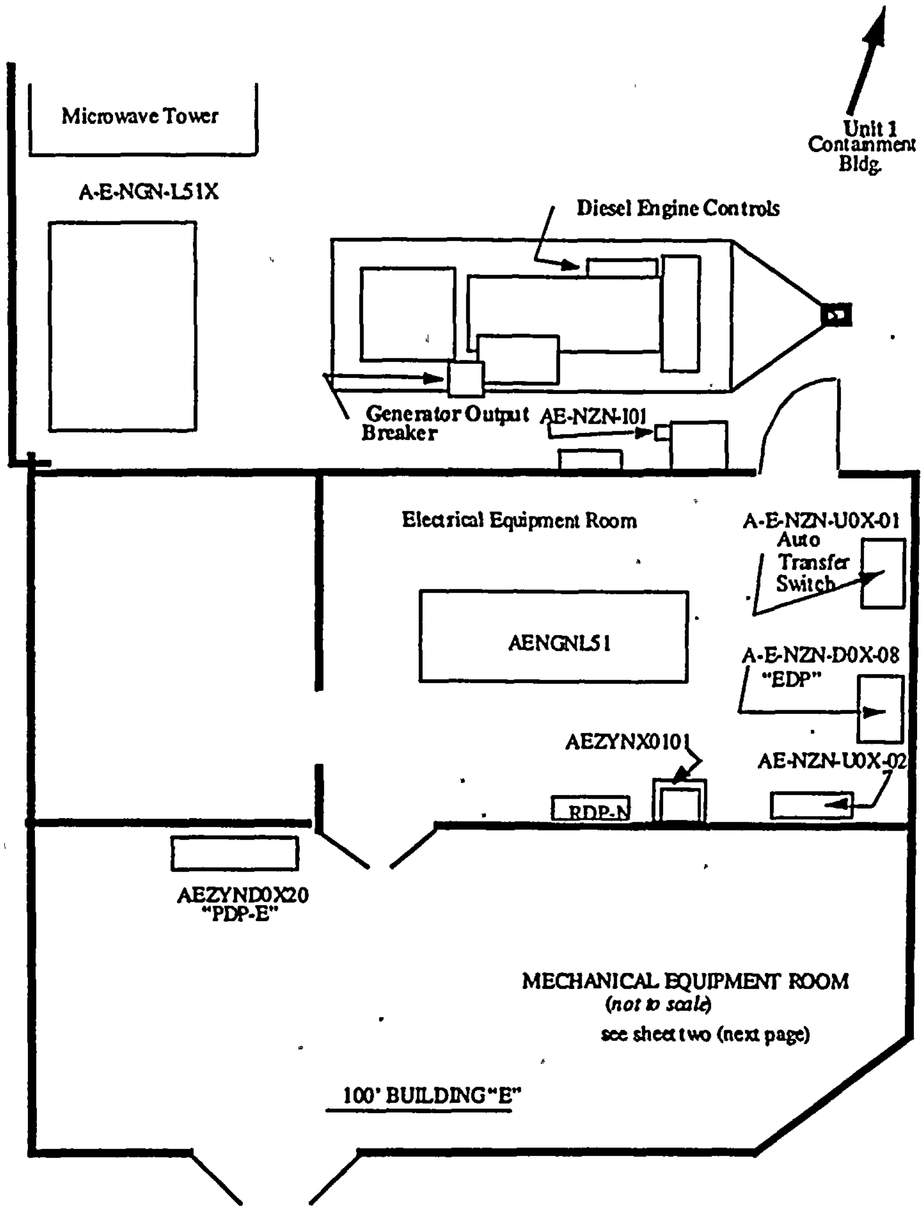
6.2 Return the throttle to the idle (approximately vertical) position.

6.3 Locate the STOP lever on the left side of the engine generator trailer (physical location is to the left of the starting switch). Rotate the lever approximately 30 degrees CW; this shuts off the fuel supply to the engine. Hold the lever in place until the engine is fully stopped, then release the stop lever.

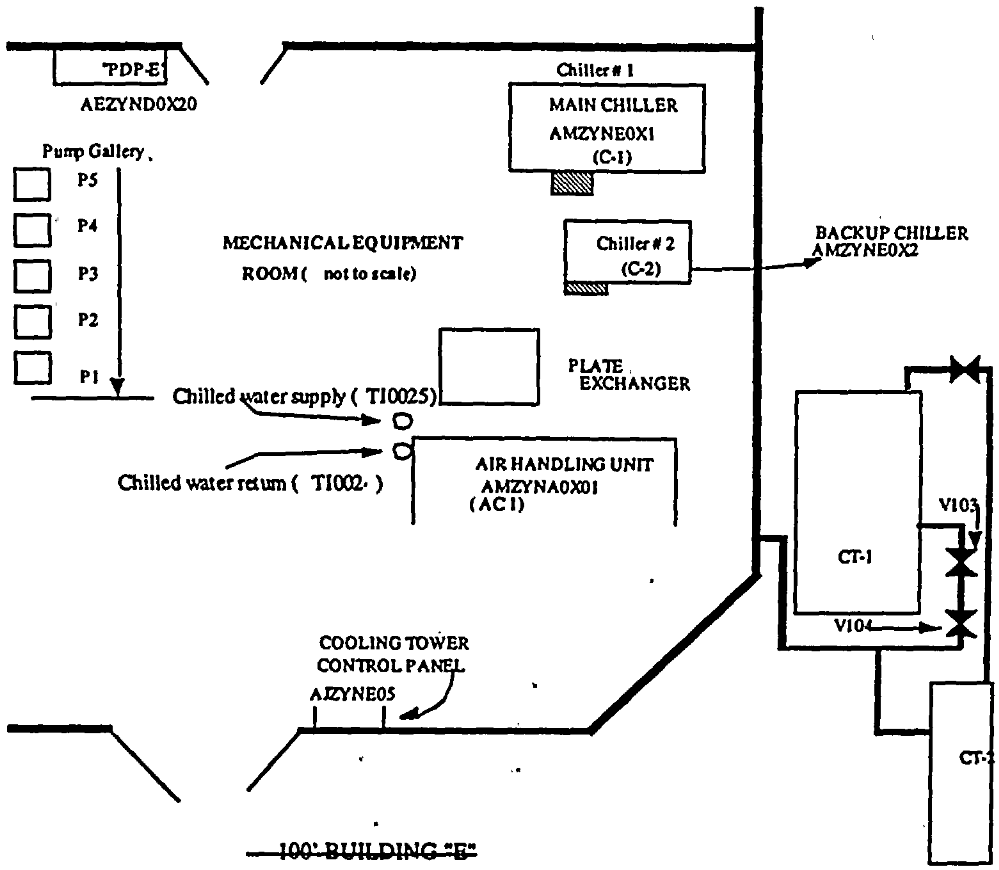
6.4 With concurrent verification, open the diesel generator AC output circuit breaker.

6.5 Notify the Administrative & Logistics Coordinator that power transfer has been completed.

Building Arrangement & Equipment Location (1 of 2)



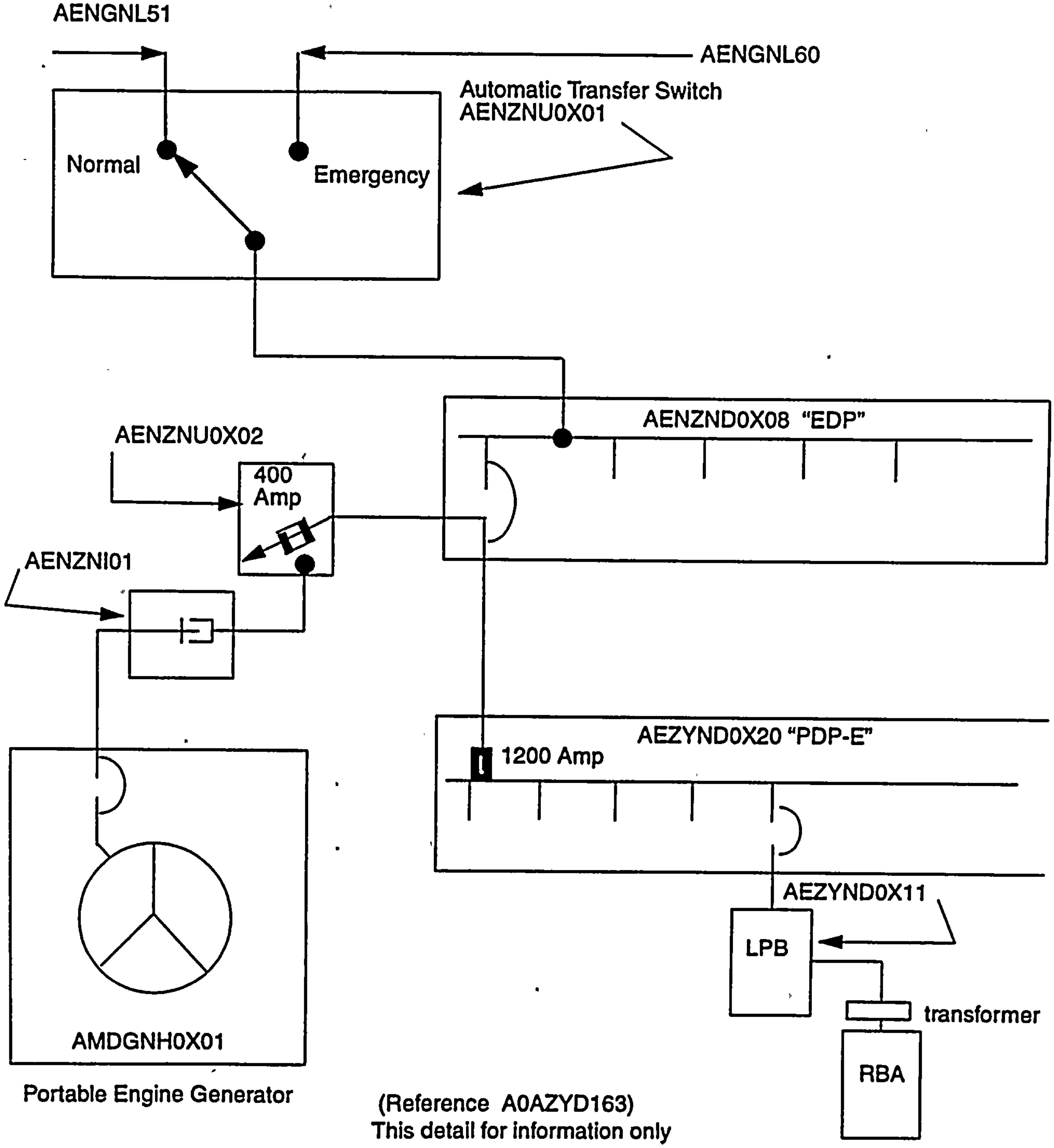
Building Arrangement & Equipment Location (2 of 2)



~~100' BUILDING "E"~~

NOTE: ▨ Designates loation of Chiller Control Panels

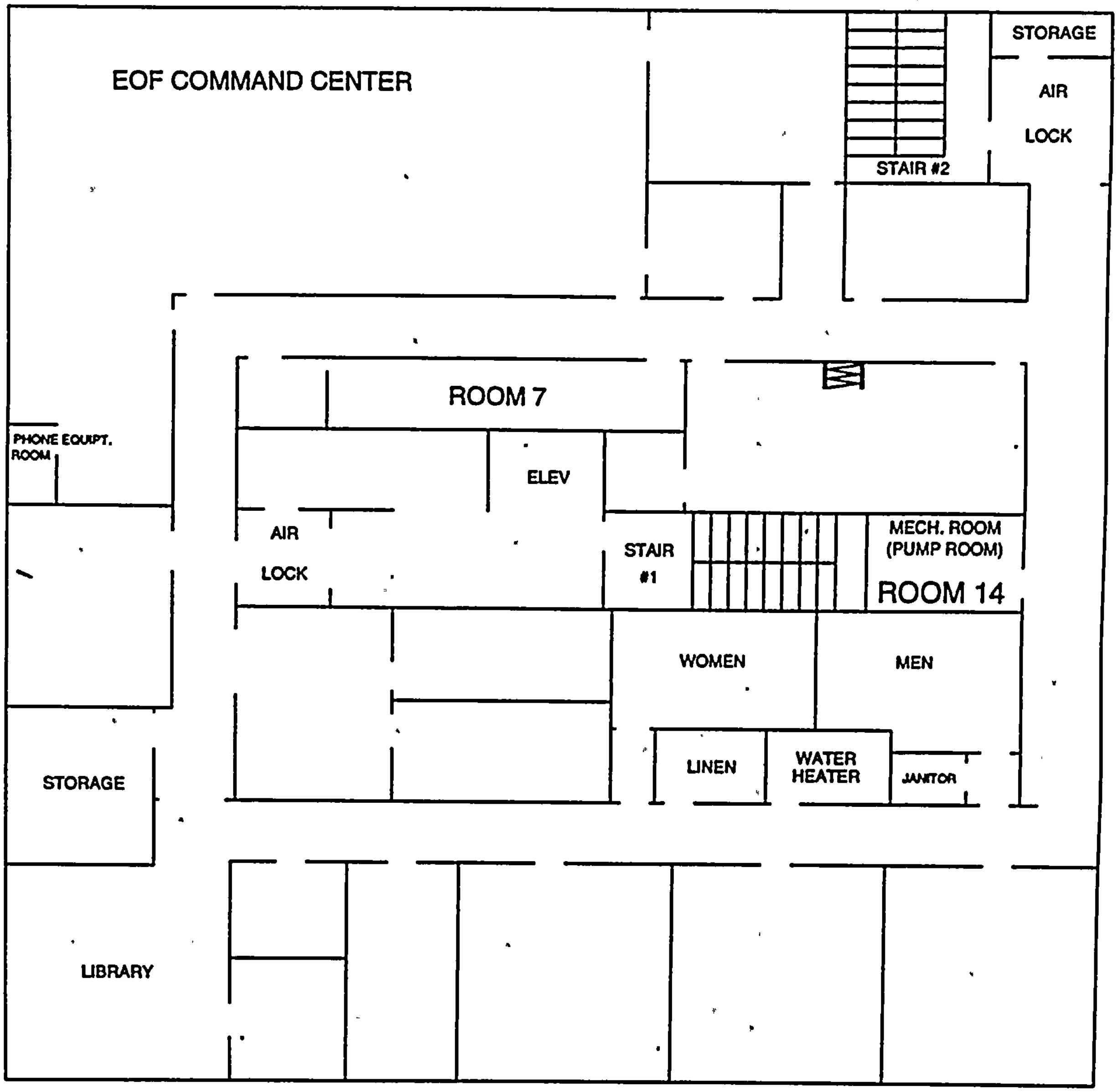
Wiring Schematic



Portable Engine Generator

(Reference A0AZYD163)
This detail for information only

EOF Floor Plan



Appendix O - ERFDADS operation

1.0 Noteworthy items:

1.1 ERFDADS is comprised of the following 4 sections:

1.1.1 SPDS Displays Menu

1.1.2 P&ID Menu

1.1.3 Thermal Performance (not addressed in this Appendix)

1.1.4 System Function Displays Menu

1.1.5 User Displays Menu (not addressed in this Appendix)

1.2 The mouse used for cursor positioning is optical in nature, making it sensitive to mouse pad orientation and mouse pad cleanliness. Food or drink should not be consumed near ERFDADS workstation areas.

1.3 If all data values on any display turn magenta, Operations Computer Systems (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

1.4 If the system appears to be functioning incorrectly or becomes locked up, the system should be rebooted.

1.5 Help is available from almost anywhere within the ERFDADS display regions. It can generally be accessed from the top menu bar by selecting the option with the left mouse button. A "Help" window will appear containing help for those items accessible within the main window in focus.

1.6 Top Menu Bar Functions

1.6.1 FILE

1.6.1.1 Reset Display: Redraws the current display back to defaults

1.6.1.2 Clear: Erases the current display except for the menu bars

1.6.1.3 Print Window Laser: Prints in black and white (this is the fastest printing option)

1.6.1.4 Enh Prnt Wndw Lsr: Prints an enhanced printout

1.6.1.5 Print Window Color: Prints a color printout

1.6.1.6 Quit: Ends the current mmi session and returns to the desktop

1.6.2 Edit: Allows use of cut and paste functions

1.6.3 OPTIONS

1.6.3.1 Point List: Lists all available ERFDADS points (~3000)

1.6.3.2 Trend List: lists all user-defined trends / groups

1.6.3.3 Logon: Allows access to controlled-access functions

1.6.3.4 Logoff: Allows logoff to prevent unauthorized access

1.7 Bottom Menu Bar Functions

1.7.1 Top Menu: Returns to the top main mmi display

1.7.2 Screen Up: Decrements 1 screen display

1.7.3 Screen Down: Increments 1 screen display

1.7.4 Previous Screen: Returns to the last displayed screen

1.7.5 Silence: Silences any Level 1 or Level 2 audible alarm

1.7.6 Audible List: Displays all points currently in alarm status

1.7.7 Text Input Box: Allows entry for a trend display name

1.8 MMI Menu Bar Functions: The mmi Menu Bar Functions are accessed by selecting the gray bar at the top of the current window with the right mouse button. The following options can be selected with the right mouse button from the drop-down menu:

1.8.1 Close: Reduces the mmi window to an icon

1.8.2 Full Size: Maximizes the current window to full-screen

1.8.3 Move: Allows for dynamic window positioning

1.8.4 Resize: Allows for dynamic window sizing

1.8.5 Back: Changes focus to other windows currently open

1.8.6 Refresh: Redraws the last display with the current time

1.8.7 Quit: Ends the current mmi session and returns to the desktop

1.9 Workspace Menu Functions: Workspace functions are accessible by closing the mmi window to an icon and selecting a point anywhere within the light blue background area with the right mouse button. The following options can be selected with the right mouse button from the pop-up menu:

1.9.1 Restart ERFDADS: Automatically shuts down and restarts the system

1.9.2 ERFDADS MMI: Allows opening of up to 4 mmi windows concurrently

1.9.3 ERFDADS CSF: Allows opening of a new SPDS window

1.9.4 Remote RMS: Opens RMS display for "Unit 1 (RED)", "Unit 2 (YELLOW)", or "Unit 3 GREEN)"

1.9.5 Print Tool: Allows spooling a SUN file to any of several printers

1.9.6 Print Window Laser: Allows black & white printout from a colored window

1.9.7 PTARS: Allows view / edit of post-trip trend data

1.9.8 Kill PTARS: Stops PTARS and returns to blank workspace display

1.9.9 Exit: Shuts down the system and returns to "Logon" display

1.10 SPDS Menu Functions: SPDS displays are configured to allow for monitoring of critical safety functions, to allow for event diagnosis and classification, and to notify Control Room personnel with messages similar to control board annunciators. 101 displays are available. Movement between multiple page displays can be performed by using the "Up / Down" buttons located toward the bottom of the display. The SPDS Display Menu consists of 2 pages listing the following options:

1.10.1 Critical Safety Functions: Contains 10 selections to allow operators to evaluate CSF criteria

1.10.1.1 Critical Safety Functions: Overall list of the individual critical safety functions

1.10.1.2 FR Safety Func Tracking: Allows tracking of the above functions

1.10.1.3 Safety Func Status Check: Shows status of the above functions

1.10.1.4 Reactivity Control: One of the critical safety functions

1.10.1.5 Vital Auxiliaries: One of the critical safety functions

1.10.1.6 Press Control: One of the critical safety functions

1.10.1.7 Heat Removal: One of the critical safety functions

1.10.1.8 CTMT Integrity: One of the critical safety functions

1.10.1.9 CTMT Atmos: One of the critical safety functions

1.10.1.10 Inventory Control: One of the critical safety functions

1.10.2 Safety Injection Delivery:'Contains 4 selections to provide equipment status:

1.10.2.1 HPSI Curve: Displays HPSI pump curve based on current parameters

1.10.2.2 LPSI Curve: Displays LPSI pump curve based on current parameters

1.10.2.3 Train A/B SI: Displays current status of pumps / valves and parameters

1.10.3 Operator Information: contains 5 selections to aid operators:

1.10.3.1 Event Classification: Suggests event classifications based on parameters

1.10.3.2 Personalities: Allows selecting Control Room Supervisor, Primary Operator, or Secondary Operator

1.10.3.3 SPDS Overview: Provides an overview of SPDS

1.10.3.4 PZR Cooldown: Shows pressurizer cooldown rate in deg F/hr and 15 minute averages

1.10.3.5 RCS Cooldown: Plots 15-minute average primary cooldown rates

1.10.3.6 Multi-Input: Displays pages of multi-input parameters for SPDS

1.10.3.7 Rad Monitors: Summary of current radiation levels

1.10.3.8 RCS P/T - NPSH Curve: Displays RCP parameters with typical NPSH curves

1.10.3.9 ERDS Link: Allows activation of the ERDS link to the USNRC

1:11 Advisory Messages: At the bottom of each SPDS display are 5 buttons corresponding to 5 message sets the operator can use for immediate notification of system, component, or parameter status. Each can be displayed in 1 of 5 colors representing a hierarchy of importance. When a monitored parameter reaches a given message setpoint, the button holding the message set for that parameter will change to 1 of 5 colors and the message will be displayed within the bounds of the specified button. The 5 colors and their importance are represented as follows:

1.11.1 Red: Urgent informational messages

1.11.2 Yellow: Caution informational messages

1.11.3 Green: Important informational messages

1.11.4 Blue: Time-dependent informational messages

1.11.5 White: Helpful informational messages

1.12 Operator EOP Support: This area of the Safety Parameter Display System consists of a series of pages used to assist Control Room Operators in monitoring the status of the plant for each Emergency Operating Procedure. Following a reactor trip, ERFDADS will evaluate which event is occurring. When the "Overview" button is selected with the diagnosed EOP message, the system will display the diagnosed EOP display for that section. The diagnosis cannot be overridden. The diagnosed EOP support display must be escaped and the EOP support display for the desired EOP must be accessed. Each operator has access to selected pages in the EOP support area pertaining to the specific operator function relative to his/her Control Room position. These pages are consistent with plant equipment and parameters intended for that portion of the EOP a specific operator is currently performing. When a safety function is not satisfied, the Functional Recovery Procedure will be diagnosed by ERFDADS and the operators would begin monitoring the screens specific to that EOP.

1.13 P&ID Functions: P&ID displays organize system parameter data into a graphical layout of the system and provide the current data for each parameter associated with each layout. The 43 displays currently available are separated into similar categories - primary systems, secondary systems, electrical systems, etc. To access a system, select the P&ID box from the top menu. A display will appear with all the major systems categorically organized. Selecting a display will present that system along with most of the available ERFDADS points associated with that given system and the current status of each point. To view a trend of a specific parameter, select the given parameter's value. Either the attributes (analog or digital) display will appear or a multi-input display for a calculated point (SPDS point) will appear. If the multi-input display appears, select the point again for the attributes display. Selecting the "Trend-1" button located at the lower left portion of the attributes screen will display a trend for that specified point. To return to the system display, select "Previous Screen" twice (selecting the gray screen title button returns to the main P&ID display). Data is displayed in the P&ID screens using the following format:

1.13.1 Green: Reliable value

1.13.2 Magenta: Failed validity check

1.13.3 White: Suspect data

1.13.4 Orange: Exceeded a rate-of-change setpoint

1.13.5 Yellow: Exceeded a HI or LO setpoint (Level 2)

1.13.6 Red: Exceeded a HI-HI or LO-LO setpoint (Level 1)

1.13.7 Cyan: Manually input data

1.14 The following selections, attributes, displays, and options are available from the System Function Displays Menu:

1.14.1 Alarm Mode Selection - This option changes the mode for which alarms are determined. Modes available are Modes 1-6 and Harsh Containment. The calculation is normally performed automatically, but can be overridden by Control Room Supervision via a logon password.

1.14.2 Analog Point Attributes - This option displays the current value for any analog ERFDADS point. Also provided is information on associated instrumentation and alarm values, if appropriate. Calculated points will list, in addition, the calculations and point values which are used to determine the SPDS point.

1.14.3 Archive Copy - For normal post-trip actions, the active PTARS file can be copied to the secondary PTARS file and the active 14-hour file, to the secon-dary 14-hour file. 15 minutes should be allowed for the copy procedure to complete. Data archived in this manner can only be accessed from the server it was saved to. Copying of files with this option is also allowed for DAT tape backup purposes. All archive operations from this option can be performed at any time, regardless of reactor status.

1.14.4 Archive Retrieval - This function is used to retrieve data for ERFDADS graphs and is different than PTARS retrieval. Output from 7 available files can be viewed as trend graphs, X-Y plots, tabular lists of values, or ASCII files.

1.14.5 Audible Alarm Configuration - (function available only to OCS personnel)

1.14.6 Demand Scan - Use this selection when data for a single point (analog or digital) is needed for any single point in time. Since the result is a "snapshot" of current conditions at the time it was invoked, the value will not change. This is in contrast to the analog / digital point attributes function, which maintains a continuing update of a specified value as it changes over time.

1.14.7 Digital Point Attributes - Functions identical to the Analog Point Attributes Function, except for digital points (i.e., valve / breaker / pump states) only. Alarms can also be assigned for this option following the same procedure as discussed previous. However, since digital points monitor 2 states (0 or 1), the only value gained would be alarming pump start / stop, valve open / close, or breaker open / close.

1.14.8 ERDS Communication Link - This option is used to activate the Emergency Response Data System link to USNRC Operations Center. Instruction for use is discussed in the Emergency Response Data System Instructional Guide.

1.14.9 External Health Interface - This option is used to monitor the status of communications links from ERFDADS to QSPDS, RMS, and ERDS for errors.

1.14.10 Group Update - This function allows the user to group sets of points for display as a group trend (up to 4 points per group), group bar chart (up to 6 points per group), or a tabular display (up to 24 points per page). Group trends default to the preset range and must be changed every time they are invoked if the range was not valid. This is in contrast to user trends, which are saved with the range selected by the user and will always be loaded into memory with that range.

1.14.11 Log Information Update - This option allows the user to retrieve a saved set of data that will display the current status and current parameter value when invoked. The data can also be spooled to a printer.

1.14.12 Log Summary - The summary contains a listing of user configured files which can be used for log information update. Selecting a file name from the menu will display the particular data input for that file.

1.14.13 Message Retrieval - Use this function to monitor error and system messages. Of the 6 messages, the Primary Alarm is the most useful choice, which will invoke a listing of all alarms that have occurred. Also displayed will be the time each has occurred and the time each has cleared (if relevant), the value that caused (and cleared) the alarm, and the type of alarm (Level 1 / Level 2). By specifying a filter, the user can select which alarms to display based on the plant system designator. The time frame available, however, is limited to the current active 14-hour file.

1.14.14 Password Update - Passwords can be changed from this option. Access is limited to Operations Computer Support personnel only.

1.14.15 Point Summaries - This summary provides a list used to check the status of various points, such as those alarming, those which have their alarm function bypassed, those which have an audible alarm assigned, those removed from scan, those assigned manually substituted values, or those currently without valid values. Separate listings exist for analog and digital points.

1.14.16 System Health - This function is used to monitor the status of all ERFDADS terminals having the ability to access the specific Unit's data (18 terminals).

1.14.17 Tabular Display - Selecting this option invokes a tabular listing of up to 24 points per page, each of which will list the point name, description, and the current value with units of measurement.

1.14.18 Unit / Server Switch - This option is used to change the Unit or server from which to receive data. 2 redundant servers exist, of which each is capable of performing all functions in the event that the other server is no longer capable of performing its function. Each STSC terminal in a specified Unit should be linked to a different server. When server changes are made and the "Apply" option is selected from the pop-up window, the white highlighted text will shift to the new server selected and the switching is completed. When switching Units, compliance with the pop-up message box is required. The user must wait approximately 1 minute for confirmation that the change has occurred prior to continuing.

2.0 Troubleshooting the System

2.1 Mouse Will Not Move or Moves Slowly - The mouse used for cursor positioning is optical in nature, making it sensitive to mousepad orientation and mousepad cleanliness. Rotate the mousepad 90º and clean the pad. Ensure that the mouse connector to the keyboard is fully inserted. Ensure that the keyboard connector to the computer is fully inserted.

2.2 System is Responding Extremely Slowly - The most likely cause is that both terminals are linked to the same server. Ensure that each terminal is linked to a different server. If the problem persists, exit the system on 1 terminal and log back on. Repeat this procedure for the other terminal.

2.3 Fatal Error Message Received When Trying to Retrieve Data - Verify that the correct date and time were entered and that the correct data file is being used for the date and time desired. For example, this error may occur if the user is attempting to retrieve data 18 hours old from the 14-hour file. This error can also occur when a user selects a PTARS data file and 1 of the points displayed is not a PTARS point. In this case, the invalid point should be deleted or a different data file type should be selected. Server shifts can also occur after performing an archive copy. The cause for this is unknown, but the user should ensure that the server the terminal is linked to remains the same after the copy is performed. If it is not, the terminal should be switched back to its original server.

2.4 MMI Display has Disappeared - Search for an mmi icon at the bottom of the current display. If found, reopen the window with a double-click on the icon with the left mouse button. If no icon is found, select a point anywhere within the light blue background area with the right mouse button. This action will invoke the Workspace Menu. Select "ERFDADS MMI" if listed or "Restart ERFDADS" if it is not.

2.5 Data is Missing From the Point List / Trend List - This error message can occur when trying to invoke a trend list or when trying to transmit a trend to 1 of the terminals in the Control Room. If an error message stating that no files can be found or that the file cannot be sent, the link to that module has most likely been lost. The system must be rebooted to reconnect all file links.

2.6 All Data Values on a Display Turn Magenta - 1 or both DAS Units have crashed. Invoke the "System Health" display from the "System Functions" Menu and view the status of the DAS Units. If only 1 unit is unavailable, switch to the available server. If both DAS Units are unavailable, the system is unavailable and is not accessible from any of the units. Contact 1 of the other Units to ensure availability of meteorological data. Operations Computer Support (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

2.7 Auto-Logout Message Received - This is a normal message that is received when 5 minutes have elapsed after performing a logon to activate ERDS or to perform an Archive Copy. The automatic logoff occurs to prevent unauthorized access should the user leave the area. Auto-Logout has no effect on system capabilities.

2.8 Color to Black & White Prints Not Working - If the correct screen print is not occurring (i.e., a zoomed icon picture prints), ensure that the mmi icon is reopened within 8 seconds. The "Snapshot" program incorporates an 8-second delay to allow the user to select the desired window. When the 8 seconds have timed out, the next item which is selected will print.

2.9 System Appears to Function Incorrectly or is Locked Up - Perform a system reboot.

3.0 System shutdown

If it becomes necessary to shut down the system for the purpose of rebooting, perform the following actions:

3.1 Close the "mmi" window by selecting the "down arrow" button toward the upper left portion of the display with the left mouse button.

3.2 Invoke the "Workspace Menu" by selecting a point anywhere within the light blue background area with the right mouse button.

3.3 Select "EXIT" from the "Workspace Menu" with the right mouse button.

4.0 System startup

If the system accepts no mouse commands, perform the following actions to start up the system:

4.1 Press the <STOP> and <A> keys simultaneously.

4.2 From the "Options" List, type N (new) at the ">" Prompt. (This display may not appear.)

4.3 Press <Return>.

4.4 When the "Type Help for more information" message appears, type sync on the "OK" Line.

4.5 Press <Return>.

4.6 At the Login Display, type ERFDADS (or the STA Login ID) and press <Return>.

4.7 At the "Password" display, press <Return>.

5.0 ERDS Transmission Data Set

POINT ID	DESCRIPTION	POINT ID	DESCRIPTION
ARF38	Condenser Air Removal Flow	SPDS 0093	RCS T-Cold Loop 1A
CPF42	Plant Vent Exhaust Flow	SPDS 0094	RCS T-Cold Loop 1B
HFF93	Fuel Building Exhaust Flow	SPDS 0095	RCS T-Cold Loop 2A
RDL10	Reactor Cavity Sump Level	SPDS 0096	RCS T-Cold Loop 2B
RDL410	CTMT Sump Level East	SPDS 0109	Time Since Reactor Trip
RDL411	CTMT Sump Level West	SPDS 0143	Wind Speed - 35' 15-Minute Avg
SEJ1AA	Excore Log Power Channel A	SPDS 0144	Wind Direction - 35'
SEJ1BB	Excore Log Power Channel B	SPDS 0146	Atmospheric Stability Class
SENIS1	Excore StartUp Power Channel 1	SPDS 0194	Estimated Core Flow - lb/m Avg
SENIS2	Excore StartUp Power Channel 2	SPDS 0203	Charging Flow
SIL706	CTMT Recirculation Sump A Level	SPDS 0215	LPSI A Flow
SIL707	CTMT Recirculation Sump B Level	SPDS 0216	LPSI B Flow
SPDS 0001	Pressurizer Pressure	SPDS 0217	HPSI Flow to Loop 1A
SPDS 0002	CTMT Pressure	SPDS 0218	HPSI Flow to Loop 1B
SPDS 0003	S/G #1 Pressure	SPDS 0219	HPSI Flow to Loop 2A
SPDS 0004	S/G #2 Pressure	SPDS 0220	HPSI Flow to Loop 2B
SPDS 0005	S/G #1 Actual Wide Range Level	SPDS 0606	RU-004 10-Minute Avg
SPDS 0006	S/G #2 Actual Wide Range Level	SPDS 0607	RU-005 10-Minute Avg
SPDS 0007	Auxiliary Feedwater Flow to S/G #1	SPDS 0635	RU-139A 10-Minute Avg
SPDS 0008	Auxiliary Feedwater Flow to S/G #2	SPDS 0636	RU-139B 10-Minute Avg
SPDS 0009	CTMT Temperature	SPDS 0637	RU-140A 10-Minute Avg
SPDS 0013	Log / Linear Reactor Power	SPDS 0638	RU-140B 10-Minute Avg
SPDS 0015	Reactor Vessel Level - Head	SPDS 0639	RU-141 10-Minute Avg
SPDS 0016	Reactor Vessel Level - Plenum	SPDS 0640	RU-143 10-Minute Avg
SPDS 0017	RCS T-Hot Loop 1	SPDS 0643	RU-145 / 146 10-Minute Avg
SPDS 0018	RCS T-Hot Loop 2	SPDS 0644	RU-148 10-Minute Avg
SPDS 0021	Subcooling Margin	SPDS 0645	RU-149 10-Minute Avg
SPDS 0052	RWT Level	SPDS 0671	RU-155D 10-Minute Avg
SPDS 0054	Actual Pressurizer Level	SPDS 5035	S/G #1 Feed Flow Rate
SPDS 0079	Representative CET	SPDS 5036	S/G #2 Feed Flow Rate
SPDS 0082	CTMT Hydrogen Concentration		

Appendix P - Recovery Organization

1.0 Noteworthy items

1.1 Recovery operations may initiate when the plant is in a controlled and stable condition. No action should be taken to disturb this condition without express approval of the Recovery Manager.

1.2 Long term post-emergency efforts that follow a major incident are a functional responsibility of the Recovery Organization and can be performed by PVNGS and other Arizona Public Service Company personnel, contract experts and specialists, and qualified engineers under the direction of the Recovery Organization.

1.3 The Emergency Operations Director, filled by the Vice President - Nuclear Production, or designated alternate, will assume the duties and responsibilities of the Recovery Manager and, with the advice of the Emergency Coordinator, will be responsible for implementing the direction in this document. S/he will have overall corporate responsibility for restoring the Unit to a normal operating configuration.

1.4 This document should be referenced when the Emergency Operations Director has determined that recovery operations are necessary to perform the following activities:

1.4.1 Identify the extent of station damage and radiological contamination

1.4.2 If appropriate, return the station to an operating status in compliance with Technical Specifications

2.0 Recovery actions

2.1 Notify affected offsite emergency management organizations (via NAN) and the USNRC (via FTS-2000 ENS) that recovery operations are in progress.

2.2 Request attendance in the Emergency Operations Facility to form the Recovery Organization by assigning available management personnel per the Recovery Organization Chart. Alternates can be utilized if positions cannot be filled by prescribed management individuals.

2.3 Direct Joint Emergency News Center personnel to conduct a final news briefing for the event and to facilitate the transfer of press operations to Arizona Public Service Media Relations.

2.4 Establish recovery operations by assessing the following issues during the implementation meeting:

2.4.1 Status of plant / site conditions, accessibility to contaminated areas, the need for additional decontamination, condition of plant equipment

2.4.2 Recovery of plant buildings or areas

2.4.3 Personnel exposures

2.4.4 USNRC involvement / interface

2.4.5 Level of offsite support required

2.4.6 Assignment of work groups, tasks, staffing, etc.

2.4.7 Logistics support - documentation, information flow, etc.

2.4.8 Preliminary damage estimates

2.5 For known or suspected significant plant damage, survey teams may be formed consisting of Operations, Engineering, Maintenance, and Radiation Protection personnel to ascertain the extent of physical damage and to identify areas of contamination and high radiation. Results of the surveys should be used by the Recovery Manager, the Station Operations Manager, and the Radiological Services Manager to plan the approach for repairing and returning the Unit to operation.

2.6 Under direction of the Recovery Manager, the Recovery Organization and selected offsite personnel, if applicable, should address the planning and coordination of the recovery effort. Activities such as the maintenance and repair of existing plant systems and/or components, modifications, installations, and decontamination should be discussed, prioritized, and planned. The need for portable shielding and special procedures should be addressed, as well.

2.7 Actual recovery operations may commence upon identification and prioritization of assessed issues, finalization of the recovery plan, development of special procedures, if necessary, and allocation of adequate repair equipment. The Recovery Manager will ensure that applicable personnel are properly trained prior to implementation of recovery operations. Training material should be developed and training conducted for specialized tasks identified.

2.8 In addition to specialized requirements in place, normal Unit / plant practices shall be followed regarding maintenance, repair, modification, installation, decontamination, and personnel exposure control.

2.9 The Radiological Services Manager should develop plans to process and control radwaste, estimate total population dose on a periodic basis in conjunction with state and federal authorities, and coordinate activities of staff Radiological Engineers and Radiation Protection personnel.

2.10 The Station Operations Manager should oversee in-plant operations on a daily basis. During recovery operations, s/he will be responsible for ensuring that plant repairs and modifications optimize post-recovery plant operational effectiveness and safety. Maintenance and Work Control Management will support the Station Operations Manager with required maintenance and repair work.

2.11 The Nuclear Support Manager should focus necessary engineering and contract resources on aspects of plant recovery requiring redesign or modification.

2.12 The Technical Support Manager should provide work analyses, guidelines, and procedures in direct support of plant operations.

2.13 The Quality Assurance Manager will ensure that the overall conduct of recovery operations is performed in accordance with corporate policy and regulations governing activities which may affect the health and safety of the public.

2.14 The Administrative / Logistics Manager will supply administrative, logistic, communications, and personnel support for the recovery operation.

2.15 The PVNGS Communications Manager should coordinate the flow of information to the media concerning recovery operations.

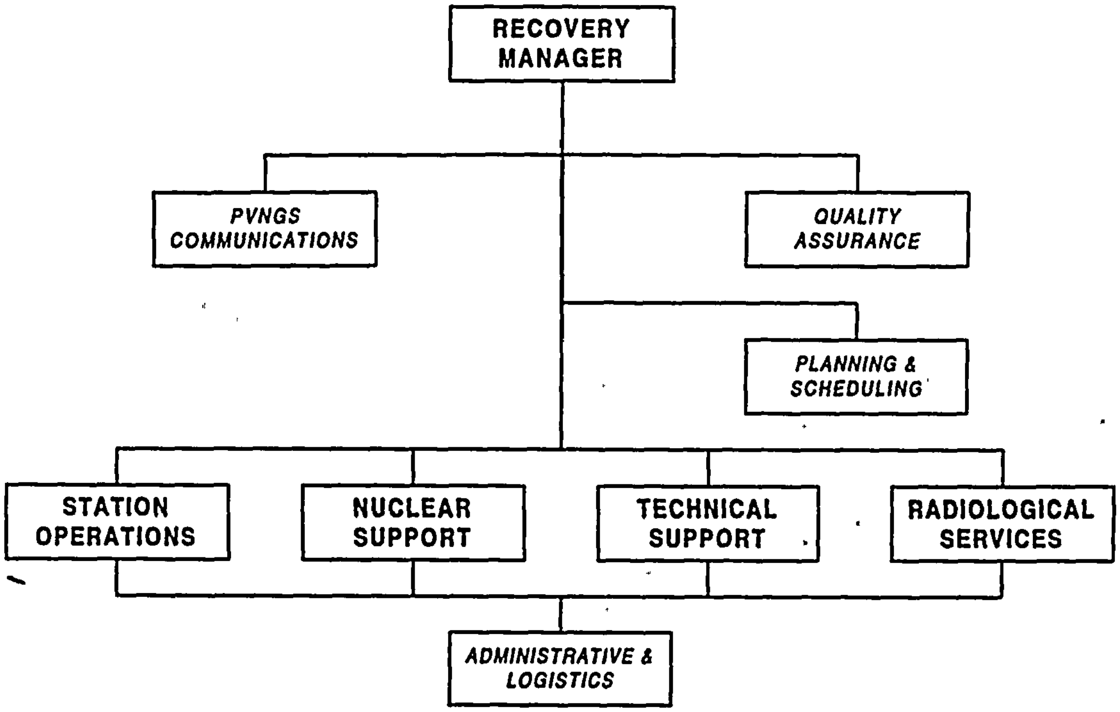
2.16 The Planning / Scheduling Manager will develop an overall schedule to guide the recovery effort.

2.17 During the course of recovery operations, unforeseen issues encountered shall be evaluated and factored into the overall recovery plan and the schedule adjusted accordingly.

2.18 Upon completion of recovery operations and prior to commencement of normal plant operations, Unit Technical Specification compliance shall be verified.

2.19 Upon completion of recovery operations, each Recovery Organization member shall submit all written documentation to the Recovery Manager, who will ensure it is forwarded to PVNGS Emergency Planning.

3.0 Recovery Organization Chart



RECOVERY ORGANIZATION	PVNGS RESPONSIBLE DEPARTMENT
RECOVERY MANAGER	EOD (Senior Vice President - Nuclear)
PVNGS COMMUNICATIONS	Strategic Communications
QUALITY ASSURANCE	Nuclear Assurance
PLANNING & SCHEDULING	Outage Department-Scheduling
STATION OPERATIONS	Operations
NUCLEAR SUPPORT	Nuclear Engineering / Projects
TECHNICAL SUPPORT	Operations Support
RADIOLOGICAL SERVICES	Radiation Protection
ADMINISTRATIVE & LOGISTICS	Nuclear Materials Management and Budgets
Italicized positions are not required as a prerequisite for formation and activation of the Recovery Organization	

Appendix Q - EAL Technical Bases

1.0 EAL TECHNICAL BASES

1.1 Introduction

1.1.1 Purpose of EAL Bases

1.1.1.1 This document was developed to provide a single source of information related to the Palo Verde Nuclear Generating Station emergency action levels. It describes the intention and technical basis for each emergency action level used to classify plant related emergencies.

1.1.1.2 Emergency action levels are plant specific indications, conditions, or instrument readings which are utilized to classify emergency conditions as defined in the PVNGS Emergency Plan. This Emergency Action Level Bases Document has been developed to facilitate the review process for revisions to the PVNGS Emergency Classification Procedure, provide historical documentation and justification for reference purposes, and to provide training to operators and decision makers that will enhance their comprehension of emergency classification.

1.1.2 Significance of EAL Bases

1.1.2.1 Not only is it necessary to know when to declare an emergency, but it is also important to know the proper level of emergency to declare. Declaration of too low an emergency classification could result in a failure to mobilize the resources necessary to deal with a degrading plant condition. Declaration of too high an emergency classification could cause unwarranted public concern and hardship. There is no single criterion which can be used to determine the exact emergency classication for a given event or plant condition. NUMARC/NESP-007 lists a number of example initiating conditions for each of the emergency classifications. All of the emergency action levels in the PVNGS Emergency Classification Procedure are based on these initiating conditions.

1.1.2.2 Emergency action levels are, for the most part, symptom based. The action level is defined by values of key plant operating parameters which identify emergency or potential emergency conditions. This approach allows the full scope of variations in the types of events to be classified as emergencies. But, a purely symptom based approach is not sufficient to address all events for which emergency classification is appropriate. Therefore, events to which no predetermined symptoms can be ascribed are also utilized as emergency action levels since they may be indicative of potentially more serious conditions not yet fully realized. Moreover, other events are selected for inclusion as emergency action levels to ensure compliance with applicable regulatory guidance, particularly Regulatory Guide 1.101.

1.1.2.3 This document ties together the aspects of emergency response implementation to the plant specific characteristics of the Palo Verde Units. By providing a detailed description of the technical basis for each action level as well as a reference to the source requirement for the action level, this document should aid those people who need to make classification decisions.

1.1.3 Scope of bases

1.1.3.1 The EALs are addressed within section 1.0 in the order by which they appear in the PVNGS Emergency Classification Procedure, each on a separate page. The page format is also explained in section 1.0. The emergency classification which should result from the initiating condition represented by the EAL is given in the upper right corner. EALs dealing with barriers or releases are usually symptom based, while others may be event oriented. The technical basis for the EAL is provided in detail, followed by references to source documents as well as NUMARC/NESP-007. In cases where PVNGS procedures were used as a reference for the technical basis, Unit 1 procedures (indicated by a "1" as the second digit of the procedure number as in 41EP-1EO01) were used to develop the technical basis. It is not anticipated that there would be differences between unit specific procedures of a magnitude or nature sufficient to affect the development of the bases. Section 1.3 contains a matrix referencing EALs from NUMARC/NESP-007 to PVNGS Emergency Classifications.

1.1.4 Regulatory requirements and guidance

1.1.4.1 The current regulatory position on nuclear power plant emergency classification methods can be found in Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50). Specifically, 10 CFR 50.47(b)(4) states: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures."

1.1.4.2 10 CFR 50 Appendix E IV (c) states: "The entire spectrum of emergency conditions that involve the alerting or activating of progressively larger segments of the total emergency organization shall be described. The communication steps to be taken to alert or activate emergency personnel under each class of emergency shall be described. Emergency action levels (based not only on onsite and offsite radiation monitoring information, but also on readings from a number of sensors that indicate a potential emergency, such as the pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described. The existence, but not the details, of a message authentication scheme shall be noted for such agencies. The emergency classes defined shall include: (1) notification of unusual events, (2) alert, (3) site area emergency, and (4) general emergency. These classes are further discussed in NUREG-0654; FEMA-REP-1."

1.1.4.3 NUREG-0654/FEMA-REP-1, Rev. 1, Planning Standard II.D., states:
"1. An emergency classification and emergency action level scheme as set forth in Appendix 1 must be established by the licensee. The specific instruments, parameters, or equipment status shall be shown for establishing each emergency class in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class.
2. The initiating conditions shall include the example conditions found in Appendix 1 and all postulated accidents in the Final Safety Analysis Report (FSAR) for the nuclear facility." Essentially, Appendix 1 of NUREG-0654 is one of the gauges to which emergency classification methods are measured. Revision 2 of Regulatory Guide 1.101, Emergency Planning and Preparedness of Nuclear Reactors, endorsed NUREG-0654.

1.1.4.4 Regulatory Guide 1.101, Revision 3 states: "The nuclear utility industry has now a decade of experience in adapting the NRC guidelines to develop sets of site-specific EALs and in using these EALs in exercises and under actual accident conditions. During this period, licensees have developed, offsite emergency response authorities have agreed upon, and the NRC has approved sets of EALs that represent broad variations in the ways the guidance in NUREG-0654 can be applied. It is possible that two plants, faced with identical conditions and applying their EAL schemes, would declare different levels of emergency (different ECLs). Also, there have been situations that were not contemplated when the guidelines were written and plant personnel were without specific guidance on which ECL to declare. ...In some cases, inconsistencies among initiating conditions together with broad ranges of risks with an initiating condition have resulted in some licensees declaring inappropriate ECLs.

In view of this experience, the Nuclear Management and Resource Council, Inc. (NUMARC) formed a task force to conduct a study to develop a systematic approach and support basis for development of emergency action levels. The methodology that was developed from this effort is described in NUMARC/NESP-007, Rev. 2, Methodology for Development of Emergency Action Levels, January 1992. NRC staff has reviewed the NUMARC methodology and considers it to be an acceptable alternative method to that described in NUREG-0654."

1.1.4.5 NUMARC/NESP-007, Revision 2 states: "This methodology develops a set of generic EAL guidelines, together with the basis for each, so that they can be used and adapted by each utility on a consistent basis. The review of the industry's experiences with EALs, in conjunction with regulatory considerations, was applied directly to the development of this generic set of EAL guidelines. The generic guidelines are intended to clearly define conditions that represent increasing risk to the public and can give consistent classifications when applied at different sites." PVNGS staff agrees with the NRC acceptance of the NUMARC methodology and adopts the guidance contained in NUMARC/NESP-007 as an alternative method to that described in NUREG-0654 for the development of emergency action levels (EALs).

1.1.5 Fission Product Barrier EAL Criteria

1.1.5.1 PVNGS Emergency Action Levels formulated according to the barrier based classification philosophy. As such, the ultimate emergency classification resulting from following PVNGS Emergency Action Levels will be based on combinations of EALS. These combinations are compiled using Table 4 of NUMARC/NESP-007 and are based on the following barrier criteria:

1. Notification of Unusual Event (NUE)

   Any loss OR any potential loss of Containment

2. Alert (ALERT)

   Any loss OR any potential loss of either Fuel Clad or RCS

3. Site Area Emergency (SAE)

   Loss of both Fuel Clad and RCS

   OR Potential loss of both Fuel Clad and RCS

   OR Potential loss of either Fuel Clad or RCS AND loss of any additional barrier

4. General Emergency (GE)

   Loss of any two barriers

   AND Potential loss of a third barrier

1.1.5.2 Although the logic used for the initiating conditions in PVNGS Emergency Action Levels appears overly complex, it is necessary to reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier. Notification of Unusual Event (NUE) initiating conditions associated with Fuel Clad and RCS Barriers are addressed under the LEAKAGE and MALFUNCTION Emergency Action Levels in PVNGS Emergency Action Levels.
- At the Site Area Emergency (SAE) level, there must be some ability to dynamically assess how far present conditions are from General Emergency. If Fuel Clad Barrier and RCS Barrier "Loss" EALs existed, this would indicate to the Emergency Operations Director (EOD) that, in addition to offsite dose assessments, continual assessments of radioactive inventory and containment integrity must be focused on. However, if both Fuel Clad Barrier and RCS Barrier "Potential Loss" EALs existed, the EOD would have more assurance that there was no immediate need to escalate to a General Emergency (GE).
- The ability to escalate to higher emergency classification levels as an event gets worse must be maintained. For example, RCS leakage steadily increasing would represent an increasing risk to public health and safety.

1.1.5.3 If a "Potential Loss" or "Loss" of a barrier in PVNGS Emergency Action Levels appears imminent (i.e., within 1 to 2 hours), a classification should be made as if the affected threshold(s) are already exceeded, particularly for the higher emergency classification levels.

1.2 Classification Criteria

1.2.1 Classification Criteria preface

1.2.1.1 NUREG-0654 FEMA REP-1 provides the definitions of each of the four emergency classifications as well as example initiating conditions which are indicative of each. The definitions provided in NUREG-0654 FEMA REP-1 are somewhat ambiguous in application and the example initiating events are not symptomatically definable or applicable in all cases.

1.2.1.2 There are three considerations related to emergency classification levels:

1. The potential impact on radiological safety, either as now known or as can be reasonably projected.
2. How far the plant is beyond its predefined design, safety, and operating envelopes.
3. Whether or not conditions that threaten health are expected to be confined to within the site boundary.

1.2.1.3 The following pages incorporate the four emergency classification level definitions as delineated within NUREG-0654. Additional discussion is provided on threshold determinations to eliminate ambiguities and to help clarify the intent of each of the emergency classification levels.

1.2.2 Notification of Unusual Event (NUE)

1.2.2.1 "Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occur."

1.2.2.2 Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant technical specification Limiting Condition for Operation (LCO) allowable action statement time for achieving required mode change. Precursors of more serious events should also be included because precursors do represent a potential degradation in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency classification level, however, releases do not require monitoring or offsite response (e.g., dose consequences of less than 10 millirem).

1.2.3 Alert

1.2.3.1 "Events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guideline exposure levels."

1.2.3.2 Rather than discussing the distinguishing features of "potential degradation" and "potential substantial degradation", a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency classification level is warranted, or whether de-escalation or termination of the emergency classification declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels (i.e., about 10 millirem to 100 millirem).

1.2.4 Site Area Emergency (SAE)

1.2.4.1 "Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels except near the site boundary."

1.2.4.2 The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines of NUMARC/NESP-007, clearly addresses NRC and offsite emergency response agency concerns as to timely declaration of a General Emergency.

1.2.5 General Emergency (GE)

1.2.5.1 "Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area."

1.2.5.2 The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore should be interpreted to include radionuclide release regardless of cause. In addition, it should address concerns as to uncertainties in systems or structures, e.g., containment, response, and also events such as waste gas tank releases and severe spent fuel pool events postulated to occur at high population density sites. To better assure timely notification, EALs in this category must primarily be expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with potential loss of the third barrier constitutes a General Emergency.

1.3 NUMARC/PVNGS EAL Matrix

1.3.1 EAL Matrix Preface

1.3.1.1 NUMARC/NESP-007 provides information by Recognition Categories in the following outline:

- A - Abnormal Rad Levels / Radiological Effluent
- F - Fission Product Barrier Degradation
- H - Hazards and Other Conditions Affecting Plant Safety
- S - System Malfunction

1.3.1.2 Within NUMARC/NESP-007, the initiating conditions for each of the Recognition Categories A, H, and S are in the order of Unusual Event, Alert, Site Area Emergency, and General Emergency. For Recognition Category F, the barrier-based EALs are presented in Table 4 (PWR).

1.3.1.3 PVNGS, as delineated in Emergency Action Levels and this EAL Technical Bases document, takes a like approach insofar as emergency classification order is concerned. However, PVNGS Emergency Action Level Event Categories have been outlined in a manner consistent with past practices due to human factors considerations. PVNGS Emergency Action Level Event Categories conform to NUMARC/NESP-007 criteria with the exception that PVNGS Emergency Action Levels further detail the EALs categorically. PVNGS Emergency Action Levels incorporate NUMARC/NESP-007 Recognition Category F as the Fission Product Barrier Reference. This layout is equivalent to the PWR-Table 4 of NUMARC/NESP-007 with the exception that the sub-columns and associated EALs for "Loss" and "Potential Loss" have been transposed due to human factors considerations. The three remaining NUMARC/NESP-007 Recognition Categories (i.e., A, H, S) are directly related to the seven PVNGS Event Categories under the following regime and comprise the rest of the PVNGS Emergency Action Levels :

- Electrical
- Radiological
- Leakage
- Malfunctions
- Hazards
- Security
- Miscellaneous

1.3.1.4 The matrix is entitled NUMARC/NESP-007 to PVNGS EAL Cross-Reference, where entries are categorized and sequenced according to NUMARC/NESP-007. This arrangement applies to Recognition Category sequence as well as emergency classification level hierarchy. A relation to the PVNGS Emergency Action Level Technical Bases can be found within the tables of PVNGS Emergency Action Levels, where the PVNGS EAL Identification Code associated with each EAL is embedded within each respective EAL Unit and corresponds to the PVNGS EAL Technical Bases number where the basis for the particular Emergency Action Level can be found. The matrix, together with PVNGS Emergency Action Levels, is intended to provide for an uncomplicated method to quickly relate EALs from one document to their counterparts in the other.

1.3.1.5 Specific NUMARC/NESP-007 Emergency Action Levels cross-referenced as "N/A" within the following tables signify no applicability of the generic EAL to PVNGS. These items are noted as exclusions to NUMARC/NESP-007 and are catalogued in section 1.4 of this document along with a basis for each exclusion.

1.3.2 EAL Matrix

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AU1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-3	N/A			
AU1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AU2-1	Table 3:	RADIOLOGICAL:		Row 6
AU2-2	Table 3:	RADIOLOGICAL:		Row 6
AU2-3	N/A			
AU2-4	Table 3:	RADIOLOGICAL:		Row 5

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
AA1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-3	N/A			
AA1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AA2-1	Table 3:	RADIOLOGICAL:		Row 6
AA2-2	Table 3:	RADIOLOGICAL:		Row 6
AA2-3	Table 3:	RADIOLOGICAL:		Row 6
AA2-4	Table 3:	RADIOLOGICAL:		Row 6
AA3-1	Table 3:	RADIOLOGICAL:		Row 6
AA3-2	Table 3:	RADIOLOGICAL:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AS1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AS1-2	N/A			
AS1-3	Table 3:	RADIOLOGICAL:		Row 4
AS1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AG1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AG1-2	N/A			
AG1-3	Table 3:	RADIOLOGICAL:		Row 4
AG1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - FUEL CLAD BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	Fuel Clad:		Row 2
3	Table 1:	Fuel Clad:		Row 1
4	Table 1:	Fuel Clad:		Row 2
5	Table 1:	Fuel Clad:		Row 3
6	N/A			
7	Table 1:	Fuel Clad:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - RCS BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	RCS:		Row 1
3	Table 1:	RCS:		Row 2
4	N/A			
5	Table 1:	RCS:		Row 3
6	Table 1:	RCS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - CONTAINMENT BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	CTMT:		Row 1, Row 2, Row 4
3	Table 1:	CTMT:		Row 3
4	Table 1:	CTMT:		Row 4
5	Table 1:	CTMT:		Row 3
6	Table 1:	CTMT:		Row 5
7	N/A			
8	Table 1:	CTMT:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HU1-1	Table 2:	HAZARDS		Row 7
HU1-2	Table 2:	HAZARDS		Row 8
HU1-3	Table 2:	MISCELLANEOUS:		Row 1
HU1-4	Table 2:	HAZARDS		Row 4
HU1-5	Table 2:	HAZARDS:		Row 2
HU1-6	Table 2:	HAZARDS:		Row 6
HU1-7	Table 2:	HAZARDS:		Row 9
HU2-1	Table 2:	HAZARDS:		Row 1
HU3-1	Table 2:	HAZARDS:		Row 5
HU3-2	Table 2:	HAZARDS:		Row 5
HU4-1	Table 2:	SECURITY:		Row 1
HU4-2	Table 2:	SECURITY:		Row 1
HU5-1	Table 2:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
HA1-1	Table 6:	HAZARDS:		Row 7
HA1-2	Table 6:	HAZARDS:		Row 8
HA1-3	Table 6:	HAZARDS:		Row 4
HA1-4	Table 8:	MISCELLANEOUS:		Row 1
HA1-5	Table 6:	HAZARDS:		Row 3
HA1-6	Table 6:	HAZARDS:		Row 6
HA1-7	Table 6:	HAZARDS:		Row 9
HA2-1	Table 6:	HAZARDS:		Row 1
HA3-1	Table 6:	HAZARDS:		Row 5
HA3-2	Table 6:	HAZARDS		Row 5
HA4-1	Table 7:	SECURITY:		Row 1
HA4-2	Table 7:	SECURITY:		Row 1
HA5-1	Table 6:	HAZARDS:		Row 2
HA6-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HS1-1	Table 7:	SECURITY:		Row 1
HS1-2	Table 7:	SECURITY:		Row 1
HS2-1	Table 6:	HAZARDS:		Row 2
HS3-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HG1-1	Table 7:	SECURITY:		Row 1
HG1-2	Table 7:	SECURITY:		Row 1
HG2-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SU1-1	Table 2:	ELECTRICAL:		Row 1
SU2-1	Table 5:	MALFUNCTIONS:		Row 4
SU3-1	Table 5:	MALFUNCTIONS:		Row 3
SU4-1	N/A			
SU4-2	Table 3:	RADIOLOGICAL:		Row 7
SU5-1	Table 4:	LEAKAGE:		Row 1, Row 2
SU6-1	Table 5:	MALFUNCTIONS:		Row 5, Row 6
SU7-1	Table 2:	ELECTRICAL:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
SA1-1	Table 2:	ELECTRICAL:		Row 2
SA2-1	Table 5:	MALFUNCTIONS:		Row 1
SA3-1	Table 5:	MALFUNCTIONS:		Row 2
SA4-1	Table 5:	MALFUNCTIONS:		Row 3
SA5-1	Table 2:	ELECTRICAL:		Row 1

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SS1-1	Table 2:	ELECTRICAL:		Row 1
SS2-1	Table 5:	MALFUNCTIONS:		Row 1
SS3-1	Table 2:	ELECTRICAL:		Row 3
SS4-1	Table 5:	MALFUNCTIONS:		Row 3
SS5-1	Table 5:	MALFUNCTIONS:		Row 2
SS6-1	Table 5:	MALFUNCTIONS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SG1-1	Table 2:	ELECTRICAL:		Row 1
SG2-1	Table 5:	MALFUNCTIONS:		Row 1

1.4 Exclusions to NUMARC/NESP-007

The EALs in the EXCLUSIONS TO NUMARC/NESP-007 Section are addressed ***in the order by which they appear in NUMARC/NESP-007*** and the basis and justification for exclusion of each NUMARC EAL will begin on a new page. The format of each page will comply with the following regime:

APP MODE: **MODES x - x** ***CLASS:*** **xxxxx**

CATEGORY: **[A, F, H, S]** ***(Recognition Category)***

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

EXCLUSIONARY BASIS:

(The full technical basis supporting the exclusion of the EAL from PVNGS Emergency Action Levels and any other information and/or justification regarding the basis)

SOURCE DOCUMENT:

(The source document(s) used.as reference for the exclusionary basis)

APP MODE: MODES 1 - 6 *CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.

3. Valid reading on perimeter radiation monitoring system greater than 0.10 mR/hr above normal background for 60 minutes [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AU1-1, AU1-2, and AU1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected Increase in Plant Radiation or Airborne Concentration.

3. (Site-specific) radiation reading for irradiated spent fuel in dry storage.

EXCLUSIONARY BASIS:

PVNGS does not incorporate spent fuel dry storage facilities in its design. Reliance on spent fuel temporary storage capabilities is accomplished in the Spent Fuel Pool and is addressed by AU2-1, AU2-2, and AU2-4. This EAL is excluded from the PVNGS EAL scheme because no spent fuel dry storage modules exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.

3. A valid reading on perimeter radiation monitoring system greater than 10.0 mR/hr sustained for 15 minutes or longer [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AA1-1, AA1-2, and AA1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 100 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AS1-1, AS1-3, and AS1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6 **CLASS:** GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 1000 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AG1-1, AG1-3, and AG1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 **CLASS:** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Fuel Clad Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Fuel Clad Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Other (Site-Specific) Indications (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Fuel Clad Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of RCS Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the RCS Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

4. Containment Radiation Monitoring (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

Two other radiation monitors, RU-148 and RU-149, which are the containment high range area monitors, would indicate off-scale LO readings under conditions warranting use of radiation monitoring when the reactor coolant noble gas and iodine inventory associated with normal operating concentrations *(i.e., within Tech Specs)* are assumed to be instantaneously released and dispersed into containment.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 ***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Containment Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Containment Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Containment Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	***CLASS:*** N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

7. Other (Site-Specific) Indications (Containment Barrier)

EXCLUSIONARY BASIS:

This EAL encompasses other site-specific indications which could be used to signify a "Loss" or "Potential Loss" of the Containment Barrier. Specifically addressed are area or ventilation monitors in the containment "annulus" or other contiguous buildings. PVNGS Emergency Operating Procedures do not provide for containment venting as a method utilized to preclude conditions where a potential loss or loss of the containment barrier could occur. Under these conditions, the hydrogen recombiners would be put into service some 100 hours subsequent to a loss of coolant accident *(LOCA)* for purposes of addressing the potential hydrogen problem which may result from the LOCA. Containment venting is only performed during normal routine plant operations.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Containment Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6 — *CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.

1. (Site-Specific) radiation monitor readings indicating fuel clad degradation greater than Technical Specification allowable limits.

EXCLUSIONARY BASIS:

This EAL is not applicable to PVNGS due to incorporation of no failed fuel monitor within its design. However, RCS Letdown Radiation Monitor, RU-155D, is used for trend analysis in determining changes in RCS activity which would denote changes in fuel clad integrity. It is neither Technical Specification related nor is it to be used for quantification of fuel clad degradation. The sole function of RU-155D is to provide trend data as a basis for RCS sampling frequency.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
Engineering Calculation 13-JC-SQ-215, RE-155D, Total Loop Uncertainty and Setpoint, Rev. 0
PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 2
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 00.10
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5 PVNGS EAL Technical Bases

1.5.1 Introduction

The EALs in the Technical Bases Section are addressed on the following pages, ***not necessarily in the order by which they appear in Tables 1 through 8 of the procedure,*** and the technical composition for each will begin on a new page. The format of each page will comply with the following regime:

APP MODE: MODES x - x ***CLASS:*** xxxxx

CATEGORY: [A, F, H, S] *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

PVNGS EMERGENCY ACTION LEVEL (EAL):

(The PVNGS specific EAL as presented in PVNGS Procedures)

LOCATION: PVNGS Emergency Action Levels - Table (1 through 8): (Category, Row)

TECHNICAL BASIS:

(The technical basis supporting the EAL as stated)

NUMARC DEVIATION:

(The deviation(s) to the NUMARC/NESP-007 EAL and justification)

SOURCE DOCUMENT:

(The source document(s) used as reference for the basis and deviation justifications)

(EAL number)

n-n

1.5.2 1-1

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Core Exit Thermocouple Readings

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Highest valid CET temperature > 700°F*

LOSS: *Highest valid CET temperature > 1200°F*

LOCATION: Table 1: FUEL CLAD / Row 1

TECHNICAL BASIS:

Maximum allowed RCS pressure is 2750 psia per PVNGS Technical Specifications Section 2.1.2. Maximum instrument error *(specified in 41EP-1EO01 Appendix S)* for RCX-PT-102x, wide range pressurizer pressure instrument, is ± 390 psi. Maximum actual system pressure is 3140 psia for an indicated pressure of 2750 psia. Saturation temperature for this pressure is 702°F. If one or more CETs indicate 700°F or higher, subcooling has been lost for at least some locations in the core. CET indications at or above 700°F are a clear sign that core heat removal capability is lost or greatly reduced and one fission product barrier, the fuel clad, is threatened due to elevated fuel temperatures. 700°F qualifies as a condition representing a "Potential Loss" of the Fuel Clad Barrier.

The 1200°F temperature constitutes a "Loss" of the Fuel Clad Barrier per NUMARC/NESP-007, Rev. 2. It indicates significant superheating of the coolant.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10, Appendix S, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-1

1.5.3 1-2 (page 1 of 2)

APP MODE: **MODES 1 - 4**

CLASS: **N/A**

CATEGORY: **[F] Fission Product Barrier Degradation**

NUMARC/NESP-007 INITIATING CONDITION:

5. Reactor Vessel Water Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RVLMS level < 21% plenum*

LOSS: *N/A*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Steam voids may form in the reactor vessel [outlet] plenum as a result of inventory loss, pressure drop, or inadequate heat removal from the core when core temperatures exceed saturation for RCS pressure following a reactor trip. During this period, cooling is typically via natural circulation. If void size cannot be controlled and the void extends into the reactor vessel outlet plenum, the heat removal process shifts from subcooled natural circulation to less efficient and non-preferred reflux boiling. Any indication of void formation requires immediate attention to control and/or reduce the size of the void and to maintain RCS heat removal capability. Voiding in the outlet plenum is most likely caused by loss of inventory or by loss of pressure control in the RCS. In either case, the fuel clad is threatened with perforation due to elevated centerline temperatures from the lower heat removal capability of reflux boiling compared to natural circulation.

The Reactor Vessel Level Monitoring System *(RVLMS)* is comprised of eight Heated Junction Thermocouples *(HJTC)* oriented vertically above the upper Fuel Alignment Plate *(FAP)* in the reactor vessel. As head and outlet plenum *(hot leg)* levels decrease, HJTCs begin to become uncovered, causing indicated temperatures for the affected HJTCs to rise as temperatures approach saturated conditions during development of the steam void. Indicated levels read out as incremental values on 1E Class instrumentation in the Control Room.

1-2

1.5.4 1-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Corresponding detector numbers and their respective indicated readings are as follows:

Detector Number Meter Reading

1 *(uncovered)* 67% head
2 *(uncovered)* 41% head
3 *(uncovered)* 16% head
4 *(uncovered)* 0% head
5 *(uncovered)* 73% plenum
6 *(uncovered)* 47% plenum
7 *(uncovered)* 21% plenum
8 *(uncovered)* 0% plenum

As can be seen, once Detector 8 becomes uncovered and detects saturated conditions, indicated level will proceed from 21% plenum to 0% plenum. From this point on, as vessel level continues to lower, it can no longer be discerned as to where actual reactor vessel water level is. The value chosen in this EAL conforms to the generic basis in that "< 21% plenum" indicates a potential loss of the Fuel Clad Barrier, as actual water level may be at the top of the active fuel, or below.

NUMARC DEVIATION:

While actual reactor vessel water level may be above the active region of the fuel after indicated water level reaches "0", it can no longer be determined exactly where actual level is when level continues to decrease. Conservatively, an assumption must be made at the time that vessel water level is AT the top of the active fuel.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ54, Monitoring the Reactor Vessel Inventory with RVLMS Inoperable, Rev. 01.02
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.5 1-3

APP MODE: MODES 1 - 4 — ***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Primary Coolant Activity Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *RCS activity > 300 µCi/gm Dose Equivalent I-131*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Due to the likelihood of fuel damage during an ATWS caused by fuel overheat due to either mechanical binding of stuck CEAs or Reactor Trip Switchgear Breaker failure, this EAL would be met if a chemistry sample analysis indicated that fuel damage exists, as signified by Dose Equivalent Iodine^{131} exceeding 300 µCi/gm. This amount of coolant activity is well above that expected for Iodine spikes and corresponds to about 2% to 5% fuel clad damage, which indicates significant clad heating. Thus, the Fuel Clad Barrier is considered lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-3

1.5.6 1-4

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Containment Radiation Monitoring

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr or RU-149 > 1.8E+06 mrem/hr*

LOCATION: Table 1: FUEL CLAD / Row 3

TECHNICAL BASIS:

The containment HI range area monitors, RU-148 and RU-149, provide radiation accident condition information inside containment. Bechtel Calculation 13-NC-ZY-216 provides a basis to correlate the readings from RU-148/RU-149 to a Core Damage Fraction *(CDF)*. The calculation uses CESSAR Table 15.6.5-1 for Source Term and assumes that 100% of the Equilibrium Noble Gas and 25% of the Equilibrium Iodine are airborne in containment. Per this calculation, a CDF of 1% equates to readings of 1.2E+06 mrem/hr on RU-148 and 1.8E+06 mrem/hr on RU-149 and is based on 300 µCi/gm Dose Equivalent $Iodine^{131}$ in the containment atmosphere. An assumption in the calculation consists of a reactor shutdown 15 minutes ago, yielding an effective age of 0.25 hours. The corresponding readings for both radiation monitors differ slightly due to their respective physical locations within containment.

NUMARC DEVIATION:

NUMARC/NESP-007 specifies these values should be based on an "approximate" clad failure of 2%-5%, depending on core inventory and RCS volume. Cores associated with the PVNGS Units are larger than normal and the Bechtel Calculation assumes 1% clad failure with a LOCA to arrive at the values given for this EAL.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Procedure 74CH-9ZZ87, Iodine-131 Dose Equivalent Determination, Rev. 2
PVNGS Unit 1 Technical Specifications, Amendment 74
Bechtel Calculation 13-NC-ZY-216, Rev. 1
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Table 15.6.5-1
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-4

1.5.7 1-5

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

7. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier*

LOCATION: Table 1: FUEL CLAD / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Fuel Clad Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-5

1.5.8 1-6 (page 1 of 2)

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. RCS Leak Rate

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RCS leak > 44 gpm*
LOSS: *RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling (i.e., RCS at saturation conditions)*

LOCATION: Table 1: RCS / Row 1

TECHNICAL BASIS:

RCS leakage is the flow of any reactor coolant out through the RCS pressure boundary to any location by a means other than design flow or drainage of coolant as part of an authorized procedure. It may be detected by any or all of the following means:

- Increasing containment radiation levels or airborne activity levels.
- Increasing containment sump levels, temperature, pressure, or humidity.
- Increasing steam generator blowdown radiation levels or steam line radiation levels or steam generator activity.
- Increasing radiation levels, airborne activity levels, or sump levels in the auxiliary building.
- Decreasing RCS pressure or pressurizer level *(with no other transient in progress).*
- Reactor Coolant System leak rate determination.

Measurement of the rate may be made by an RCS inventory balance *(conducted at least every 72 hours in accordance with 40ST-9RC02, RCS Water Inventory Balance, or as part of Procedure 41EP-1RO02, Loss of Coolant Accident)* or by observation that pressurizer level continues to decrease with letdown isolated and one charging pump running in a normal configuration.

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any RCS leakage which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of RCS subcooling has occurred. The loss of RCS subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

1-6

1.5.9 1-6 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.10 1-7 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. SG Tube Rupture

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *SGTR leak > 44 gpm*

LOSS: *SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1)*

LOCATION: Table 1: RCS / Row 2

TECHNICAL BASIS:

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any SGTR event which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses ruptured S/Gs with an unisolable secondary line break corresponding to the loss of the RCS Barrier and the Containment Barrier. ***(NOTE:** the Containment Barrier loss is represented by the "Secondary Side Release with Primary-to-Secondary Leakage" EAL.)* This allows the direct release of radioactive fission and activation products to the environment. Since actual leak rate is a function of the offsite dose rates attainable for this event, 132 gpm is consistent with the diagnostic activities of the applicable Emergency Operating Procedure *(i.e., 41EP-1RO03, Steam Generator Tube Rupture).* This includes indication of a primary coolant inventory reduction and increased secondary radiation levels. 41EP-1RO08, Functional Recovery, would be the applicable procedure for a SGTR along with an uncontrolled or complete depressurization of the ruptured S/G. Secondary radiation increases are observed via radiation monitoring of condenser off-gas, S/G blowdown, main steam, and/or S/G sampling. Determination of the "uncontrolled" depressurization of the ruptured S/G is based on indication that the pressure decrease in the ruptured S/G is not a function of normal operator actions. The Limitations Topic Area in PVNGS Emergency Action Levels, qualifies this part of the event. Emergency Operating Procedures direct the subsequent plant cooldown to take place utilizing steaming of the unaffected S/G. The "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization due to the same effect this action has on offsite dose rates in relation to dose rates caused by steam line breaks or stuck open S/G safety valve*(s).*

1-7

1.5.11 1-7 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance with the exception of where the "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization, as referenced in the PVNGS Emergency Action Levels. This condition would involve a prolonged release of contaminated secondary coolant from the affected S/G to the environment if that affected S/G is utilized for plant cooldown to Mode 5 *(Cold Shutdown)* because plant Emergency Operating Procedures direct plant cooldown via steaming of the unaffected S/G to the condenser, which is the preferred path.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO03, Steam Generator Tube Rupture, Rev. 00.08
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.12 1-8

APP MODE: MODES 1 - 4	***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Other (Site-Specific) Indications

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *LOAF such that minimum acceptable feedwater flow cannot be maintained*

LOSS: *N/A*

LOCATION: Table 1: RCS / Row 3

TECHNICAL BASIS:

This EAL addresses the inability to initially remove heat from the RCS during early stages of an event, thereby jeopardizing the Heat Removal Safety Function. If emergency auxiliary feedwater flow *(and main feedwater flow)* required by design is insufficient to remove the amount of heat from at least one steam generator, an extreme challenge should be considered to exist and the RCS Barrier is potentially lost. Procedure 41EP-1RO05, Loss of All Feedwater, includes provisions for establishing feedwater flow to the S/G*(s)* under conditions where no flow could be established from the Control Room. A potential loss of the RCS Barrier exists if actions from outside the Control Room are required to establish or maintain minimum acceptable feedwater flow and all attempts from the Control Room to establish or maintain acceptable feedwater flow have been exhausted.

NUMARC DEVIATION:

This "Potential Loss" EAL meets the NUMARC/NESP-007 intent of other indications. The EAL includes a Control Room diagnosis that a loss of all feedwater condition exists with indications that feedwater flow to at least one S/G cannot be initiated or maintained from the Control Room.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO05, Loss of All Feedwater, Rev. 00.07
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-8

1.5.13 1-9

APP MODE: MODES 1 - 4 **CLASS: N/A**

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier*

LOCATION: Table 1: RCS / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the RCS Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-9

1.5.14 1-10 (page 1 of 2)

APP MODE: MODES 1 - 4 — *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Containment Pressure

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Row 1: CTMT pressure 50 psig and increasing*
Row 2: CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating
Row 5: H_2 concentration > 3.5% by volume

LOSS: *Row 1: Rapid unexplained CTMT pressure decrease following initial increase*
Row 2: CTMT pressure or sump level response not consistent with LOCA conditions

LOCATION: Table 1: CONTAINMENT / Row 1, Row 2, Row 4

TECHNICAL BASIS:

The only likely cause for a pressure excursion in containment at or exceeding 50 psig is a LOCA with failure of containment pressure control systems. CIAS setpoint is 3 psig. Containment Spray setpoint *(CSAS)* is 8.5 psig. In order for containment pressure to reach 50 psig, both Containment Spray trains must have already failed. Maximum allowed containment pressure by Technical Specifications is 2.5 psig. Design pressure is 60 psig. The proximity of containment pressure to design pressure, in combination with probable elevated containment air temperatures in the case of a LOCA and the demonstrated inability to control containment pressure, make the failure of containment likely. This "Potential Loss" EAL is included in PVNGS Emergency Action Levels to provide clear indication that containment integrity is threatened and to provide for a path of further escalation in the case of one or two fission product barriers already lost or threatened.

The likely source of hydrogen in containment is a LOCA into containment accompanied by severe fuel melt. A metal-water reaction of the zircalloy clad produces hydrogen in the core, which is then released into containment. Other possible sources include: radiolytic decomposition of post-LOCA emergency cooling solutions or corrosion of metals and paints by emergency cooling containment spray solutions. The conservative approach assumes that severe core damage is the source. Core damage and leakage of this magnitude clearly indicate a failure of two fission product barriers. Hydrogen levels of this magnitude in containment would likely be accompanied by elevated containment pressure and, with hydrogen approaching the lower flammable limit of 4%, would threaten containment integrity with a further pressure spike from a hydrogen burn. Rapid unexplained loss of containment pressure which is not directly attributable to containment spray or condensation effects following an initial pressure increase indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

1-10

1.5.15 1-10 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUREG/BR-0150, USNRC RTM-92, Response Technical Manual, Volume 1 Rev. 2, October 1992
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.16 1-11

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Significant Radioactive Inventory In Containment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr or RU-149 > 8.7E+09 mrem/hr*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The readings associated with RU-148 and RU-149 are values which indicate significant fuel damage well in excess of the EAL associated with loss of the Fuel Clad Barrier. A major release of radioactivity requiring offsite protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant. Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a "Potential Loss" of containment, such that a General Emergency declaration is warranted. NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates that such conditions do not exist when the amount of clad damage is less than 20%. Hence, these radiation monitor readings correspond to 20% fuel clad damage.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-11

1.5.17 1-12

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Core Exit Thermocouples

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored w/i 15 min.*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 5

TECHNICAL BASIS:

Restoration implied in the EAL assumes that function restoration procedures are considered effective if temperatures are decreasing or if vessel water level is increasing. The conditions mentioned in the EAL represent a core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with CET EALs in the Fuel Clad Barrier and leakages in the RCS Barrier, this EAL would result in the declaration of a General Emergency. There exists no success path for this event if function restoration procedures are ineffective.

Severe accident analyses *(e.g., NUREG-1150)* have concluded that function restoration procedures can arrest core degradation within the reactor vessel in a significant fraction of the core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period to allow function restoration procedures to arrest the core melt sequence. Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Operations Director/Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be, ineffective. The reactor vessel level identified in the EAL is consistent with application to PVNGS. *(See the Technical Basis for the Fuel Clad Barrier "Potential Loss" EAL on reactor vessel water level.)*

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-12

1.5.18 1-13

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Containment Isolation Valve Status After Containment Isolation

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The PVNGS setpoint for a Containment Isolation Actuation Signal *(CIAS)* is 3.0 psig containment pressure. The likely cause for elevated containment pressure is a LOCA into containment. The containment atmosphere will be contaminated to some degree by activity from the RCS. If both containment isolation valves which are required to close on a CIAS do not fully close, there will be an unmonitored release to the environment from the containment if it is determined that a downstream pathway to the environment exists. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

This EAL addresses an incomplete containment isolation that allows a direct release to the environment. It represents a loss of the Containment Barrier.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-13

1.5.19 1-14

APP MODE: MODES 1 - 4	***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

4. SG Secondary Side Release With Primary To Secondary Leakage

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Release of contam. secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage*

LOCATION: Table 1: CONTAINMENT / Row 4

TECHNICAL BASIS:

The "Loss" EAL is based on steam generator tube leakage in excess of Tech Spec allowable S/G primary-to-secondary leakage in combination with a release of contaminated steam to the environment. Steam release may be due to a steam line break. It may also be due to operation of the main steam safety or atmospheric dump valves *(ADVs)*, or turbine-driven AF pump exhaust. These methods may release steam to the environment as a normal factor of operation. In the case of a steam line break, the leakage to the environment may not be isolable. If the release of steam is from turbine-driven AF pump exhaust, isolation will likely result in loss of steam generator feed with eventual loss of core cooling as the steam generators boil dry. The Main Steam safety or atmospheric dump valves are commonly used as a primary means of RCS heat removal during post-trip natural circulation cooling of the core. Under these conditions, a release of steam from the Main Steam safety or atmospheric dump valves cannot be isolated without loss of core cooling or risking a possible overpressure condition in the steam generators. It is likely that there will be some contamination of the steam released to the environment by leakage from the primary coolant system. This release will be unmonitored. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ08, Steam Generator Tube Leak, Rev. 00.08
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-14

1.5.20 1-15

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

8. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier*

LOCATION: Table 1: CONTAINMENT / Row 6

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Containment Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-15

1.5.21 2-1

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU1 Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers for greater than 15 minutes.
AND
b. At least (site-specific) emergency generators are supplying power to emergency busses.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power *(Station Blackout)*. Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-1

1.5.22 2-2 (page 1 of 2)

APP MODE: **MODES 5 - 6, Defueled**

CLASS: **NUE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU7 Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for Greater Than 15 Minutes.
1. Either of the following conditions exist:
a. Unplanned loss of Vital DC power to required DC busses based on (site-specific) bus voltage indications.
AND
b. Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:
The purpose of this EAL is to recognize a loss of DC power compromising the ability to monitor and control the removal of decay heat during Cold Shutdown or Refueling operations. This EAL is anticipatory in as much as the operating crew may not have necessary indication and control of equipment needed to respond to the loss. "Unplanned" is included in this EAL to preclude the declaration of an emergency as a result of planned maintenance activities. The intention is that the loss of the operating *(OPERABLE)* train is to be considered when the other redundant train may be out of service.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

2-2

1.5.23 2-2 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.24 2-3 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **ALERT**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA5 AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout.
1. Either of the following conditions exist: (a and b)
a. Loss of Power to <site-specific> Transformers for Greater Than 15 Minutes, AND
b. Onsite Power Capability has been Degraded to one (Train of) Emergency Bus(ses) Powered From a Single Onsite Power Source due to the Loss of: <site-specific list>

PVNGS EMERGENCY ACTION LEVEL (EAL):

Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition:

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG)
OR
Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR)

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

This EAL is intended to provide an escalation from EAL [SU1-1]. The condition indicated is the degradation of the offsite and onsite power systems such that any additional single failure would result in a total loss of power to both essential buses. This condition could occur due to a loss of offsite power with a concurrent failure of one emergency diesel generator to supply power to its respective emergency bus. Another related condition could be the loss of all offsite power to the essential buses from the ESF Transformers and loss of both emergency diesel generators with only one train of emergency buses being backfed from the unit main generator, or the loss of both emergency diesel generators with only one train of emergency buses being backfed from offsite power. The subsequent loss of this single power source would escalate the event to an SAE in accordance with EAL [SS1-1]. Control Room indications representing this condition would be all power supplies to both essential buses unavailable except for a single power source such that if lost, would establish the single failure vulnerability. Since PVNGS is a multi-unit site, credit is allowed for a cross-tie of another unit's emergency diesel generator, provided that the evolution is being directed by plant procedures. However, the impact of this condition on other safety functions must be considered.

2-3

1.5.25 2-3 (page 2 of 2)

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

This EAL does not address specific Control Room annunciator indications for this condition due to the inconsistencies associated with it. Control Room annunciation is utilized in analyzing the condition, as directed by plant annunciator response procedures which direct subsequent actions based on priorities established within those procedures.

SOURCE DOCUMENT:

41AL-1RK1A, Panel B01A Alarm Responses, Rev. 03.01
41AL-1RK1B, Panel B01B Alarm Responses, Rev. 02.08
41AL-1RK1C, Panel B01C Alarm Responses, Rev. 03.19
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.26 2-4

APP MODE: MODES 5 - 6, Defueled

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses During Cold Shutdown Or Refueling Mode.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within 15 minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. When in Cold Shutdown, Refueling, or a Defueled Mode, the event can be classified as an ALERT because of the significantly reduced decay heat, lower RCS temperature and pressure, and the increased time to restore one of the emergency buses relative to that specified for the SAE EAL. Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-4

1.5.27 2-5

APP MODE: MODES 1 - 4	CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within (site-specific) minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP).* Prolonged loss of all AC power will cause core uncovering and loss of containment integrity. Thus, this event can escalate to a General Emergency. The fifteen minute time duration is selected to exclude transient and momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.28 2-6

APP MODE: MODES 1 - 4	***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS3 Loss of All Vital DC Power.
1. Loss of All Vital DC Power based on (site-specific) bus voltage indications for greater than 15 minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all DC power compromises the ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the Reactor Coolant System. Fifteen minutes is selected as a threshold to exclude transient and momentary power losses.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.29 2-7 (page 1 of 2)

APP MODE: MODES 1 - 4

CLASS: GE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG1 Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power.
1. Prolonged loss of all offsite and onsite AC power as indicated by:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency diesel generators to supply power to emergency busses.
AND
c. At least one of the following conditions exist:
Restoration of at least one emergency bus within (site-specific) hours is *NOT* likely
OR
(Site-Specific) Indication of continuing degradation of core cooling based on Fission Product Barrier monitoring.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4
AND
Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:
Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. Prolonged loss of all AC power will lead to loss of fuel clad, RCS, and containment. The 4.5 hour time duration to restore AC power is based on the site blackout coping analysis performed in conformance with 10 CFR 50.63 and Regulatory Guide 1.155, Station Blackout. Appropriate allowance for offsite emergency response exists. Although this EAL may be redundant to Fission Product Barrier EAL*(s)*, its inclusion is necessary to better assure timely recognition and emergency response.

2-7

1.5.30 2-7 (page 2 of 2)

TECHNICAL BASIS (continued...):

The specification of this EAL assures that in the unlikely event of a prolonged loss of power to both essential buses, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one emergency bus is based on a realistic appraisal of the situation, since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Operations Director/Emergency Coordinator a reasonable idea of how quickly *(s)*he may need to declare a General Emergency based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is IMMINENT?

2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented?

Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Operations Director/Emergency Coordinator judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

Combustion Engineering, Inc., Evaluation of a Prolonged Station Blackout with Plant Recovery, Prepared for Arizona Public Service Company, MAR 1989
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.31 3-1 (page 1 of 2)

APP MODE: MODES 1 - 6 | *CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 μCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-1

1.5.32 3-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-143 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-}06\ \frac{\text{sec}}{\text{m}^3}\right)\left(111000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 6.12\text{E-}04\ \text{uCi / cc}$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per µCi/m^3 using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:
Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.
Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.33 3-2 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.

1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure): (site-specific list)

NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:

Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer

OR

Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-2

1.5.34 3-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-145 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-}06\ \frac{\text{sec}}{\text{m}^3}\right)\left(43500\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.56\text{E-}03\ \text{uCi / cc}$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
43500 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per µCi/m^3 using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.35 3-3 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

3-3

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NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.37 3-4

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 0.1 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into a Notification of Unusual Event *(NUE).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-4

1.5.38 3-5

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
4. Valid Direct Area Radiation Monitor readings increases by a factor of 1000 over normal * levels.
* Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit

(normal levels comprise the highest reading in the past 24 hours excluding the current peak value)

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses unplanned increases in in-plant radiation levels that represent a degradation in the control of radioactive material, and represent a potential degradation in the level of safety of the plant. Possible events which could lead to loss of control of radioactive material of this magnitude include, but are not limited to:

w Spent resin transfer with a resin spill or resin hose break
w Waste Gas Decay Tank leak or rupture

If the increases impair safe plant operations, then this EAL escalates to an ALERT.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-5

1.5.39 3-6

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
1. (Site-Specific) indication of uncontrolled water level decrease in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water.
2. Uncontrolled water level decrease in the spent fuel pool and fuel transfer canal with all irradiated fuel assemblies remaining covered by water.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

These events tend to have long lead times relative to potential for radiological release outside the Site Boundary. Thus, impact to public health and safety is very low.

In light of reactor cavity seal failure incidents at two different PWRs and loss of water in the spent fuel pool/fuel transfer canal at a BWR, all occurring since 1984, explicit coverage of these types of events is appropriate, given their potential for increased doses to plant staff. Classification as an NUE is warranted as a precursor to a more serious event.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-6

1.5.40 3-7

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.
2. (Site-Specific) coolant sample activity value indicating fuel clad degradation greater than Technical Specification allowable limits.

PVNGS EMERGENCY ACTION LEVEL (EAL):

RCS specific activity > Technical Specification allowable limits

LOCATION: Table 3: RADIOLOGICAL / Row 7

TECHNICAL BASIS:

This EAL is considered to reflect a potential degradation in the level of safety of the plant and a potential precursor to more serious problems. The Technical Specification limit is set to ensure that following a steam generator tube rupture accident in conjunction with an assumed steady state steam generator leak rate of 1 gpm and a concurrent loss of offsite electrical power, the 2-hour dose rate to the public will not exceed ODCM limits for exposure to the public. The action required is a plant shutdown with $T_C < 500°F$ within 6 hours for activity exceeding 100/E-Bar. With the specific activity of the coolant exceeding 1.0 μCi/gm Dose Equivalent I^{131} for more than 48 hours during one continuous time interval, or exceeding a limit line specified in Technical Specifications Figure 3.4-1, the action required is plant shutdown with $T_C < 500°F$ within 6 hours. The permission to operate for a limited period of time with the primary coolant activity greater than 1.0 μCi/gm, but below the curve in Technical Specification Figure 3.4-1, accommodates possible Iodine spiking which may accompany changes in reactor thermal power.

NUMARC DEVIATION:

NONE. PVNGS Technical Specifications depicts values associated with RCS specific activity.

SOURCE DOCUMENT:

Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-7

1.5.41 3-8 (page 1 of 2)

APP MODE: MODES 1 - 6 | *CLASS:* ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer
OR
Valid
dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-8

1.5.42 3-8 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Plant Vent reading, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000 \frac{\text{mrem}}{\text{yr}}}{\left(1750 \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right) \left(8.91\text{E-06} \frac{\text{sec}}{\text{m}^3}\right) \left(111000 \text{ cfm}\right) \left(471.9 \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.22\text{E-02 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per µCi/m^3 using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.43 3-9 (page 1 of 2)

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent	

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.

1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-9

1.5.44 3-9 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20 and by a factor which is the ratio of the normal process flowrate to the Essential ventilation process flowrate for the Fuel Building Exhaust. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Fuel Bldg. Exhaust, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(12000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} \doteq 1.13\text{E-01 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
12000 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.45 3-10 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 20. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

3-10

1.5.46 3-10 (page 2 of 2)

NUMARC DEVIATION (continued...):

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.47 3-11

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 1.0 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into an ALERT.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-11

1.5.48 3-12 (page 1 of 2)

APP MODE: MODES 1 - 6 | *CLASS:* ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA3 Release of Radioactive Material or Increases in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown
1. Valid (site-specific) radiation monitor readings GREATER THAN 15 mR/hr in areas requiring continuous occupancy to maintain plant safety functions:
- (Site-specific) list
2. Valid (site-specific) radiation monitor readings GREATER THAN <site specific> values in areas requiring infrequent access to maintain plant safety functions.
- (Site-specific) list
NOTE: The Emergency Director should determine the cause of the increase in radiation levels and review other ICs for applicability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are:

(1) > 15 mR/hr:
- RU-18 Control Room
- RU-18 Secondary Alarm Station

OR

(2) > 5000 mR/hr:
- RU-18 Remote Shutdown Panels
- RU-155 Main Steam Support Structure
- RU-153c Aux Bldg, 100' East
- RU-23 Chemistry Hot Laboratory
- RU-19 Fuel Building

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses increased radiation levels that impede necessary access to operating stations, or other areas containing equipment which must be operated manually, in order to maintain safe operation or perform a safe shutdown. It is this impaired ability to operate the plant that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the increase inradiation levels is not a concern of this EAL. The Emergency Coordinator must consider the source or cause of the increased radiation levels and determine if any other EAL may be involved. For example, a dose rate of 15 mrem/hr in the Control Room may be a problem in itself. However, the increase may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, an SAE or GE may be indicated by the fission product barrier matrix EALs.

3-12

1.5.49 3-12 (page 2 of 2)

TECHNICAL BASIS (continued...):

At PVNGS, this EAL could result in a declaration of an ALERT at one unit due to a radioactivity release or radiation shine resulting from a major accident at another unit. This is appropriate if the increase impairs operations at the operating unit.

This EAL is not meant to apply to increases in the containment dome radiation monitors (*RU-148 and/or RU-149*), as these are events which are addressed in the Fission Product Barrier Reference EALs. Nor is it intended to apply to anticipated temporary increases due to planned events *(e.g., incore detector move-ment, radwaste container movement, depleted resin transfers, etc.)*.

Areas requiring continuous occupancy include the Control Room and the Secondary Alarm Station. The Radwaste Control Room is not determined to require continuous occupancy because radwaste systems are not in use following accident situations where dose rates may escalate beyond normal levels per the SER, Chapter 22, 11.B.2. The value of 15 mrem/hr is derived from the General Design Criteria-19 *(GDC-19)* value of 5 rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, Clarification of TMI Action Plan Requirements, provides that the 15 mrem/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30-day duration implies an event potentially more significant than an ALERT.

Areas requiring infrequent access are those which house equipment that do/may require manual operation to maintain safe plant operations or perform a safe plant shutdown. The Remote Shutdown Panels Area must be manned under adverse Control Room conditions and is required for plant shutdown. The other areas listed in the EAL are those identified in the Unit 3 PASS Licensing Checklist and comprises areas needed for access by plant personnel under adverse radiological conditions to perform manual operations required by plant operating procedures. For areas requiring infrequent access, the 5000 mrem/hr value is based on radiation levels which result in exposure control measures intended to maintain doses within normal occupational exposure guidelines and limits *(i.e., 10 CFR 20)*, and in doing so, will impede necessary access.

The radiation monitors associated with this EAL read in Roentgen and mR, rather than rem and mrem. Surveys of areas requiring access are recorded in mrem. For nuclear power plant gamma rays *(excluding N-16)*, mrem and mR are approximately equal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix-R Operational Considerations, 29 JUL 93
ANPP Post-Accident Sampling System Licensing Technical Review Response Justification, 09 AUG 85
Engineering Calculation 03-NC-SS-A01, Post-Accident Doses, 28 JUN 87
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUREG-0857, Safety Evaluation Report Related to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2, and 3, NOV 81
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2a

1.5.50 3-13 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA2 Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.
1. A (site-specific setpoint) alarm on one or more of the following radiation monitors: (site-specific monitors)
Refuel Floor Area Radiation Monitor
Fuel Handling Building Ventilation Monitor
Fuel Bridge Area Radiation Monitor
2. Report of visual observation of irradiated fuel uncovered.
3. Water level less than (site-specific) feet for the Reactor Refueling Cavity that will result in Irradiated Fuel Uncovering.
4. Water level less than (site-specific) feet for the Spent Fuel Pool and Fuel Transfer Canal that will result in Irradiated Fuel uncovering.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal (i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication) such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur
AND
Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage, which is not applicable to PVNGS. NUREG-0818, Emergency Action Levels for Light Water Reactors, forms the basis for these EALs.

There is time available to take corrective actions, and there is little potential for substantial fuel damage. In addition, NUREG/CR-4982, Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82, July 1987, indicates that even if corrective actions are not taken, no prompt fatalities are predicted, and that risk of injury is low. In addition, NRC Information Notice No. 90-08, KR-85 Hazards from Decayed Fuel, presents the following in its discussion:

3-13

1.5.51 3-13 (page 2 of 2)

TECHNICAL BASIS (continued...):

In the event of a serious accident involving decayed spent fuel, protective actions would be needed for personnel on site, while offsite doses *(assuming an exclusion area radius of one mile from the plant site)* would be well below the Environmental Protection Agency's Protective Action Guides. Accordingly, it is important to be able to properly survey and monitor for Kr-85 in the event of an accident with decayed spent fuel.

Licensees may wish to reevaluate whether Emergency Action Levels specified in the emergency plan and procedures governing decayed fuel-handling activities appropriately focus on concern for onsite workers and Kr-85 releases in areas where decayed spent fuel accidents could occur, for example, the spent fuel pool working floor. Furthermore, licensees may wish to determine if emergency plans and corresponding implementing procedures address the means for limiting radiological exposures of onsite personnel who are in other areas of the plant. Among other things, moving onsite personnel away from the plume and shutting off building air intakes downwind from the source may be appropriate.

The 132.5 ft. elevation *(17.5 ft. above the fuel)* is based on a level corresponding to a point below which siphoning of water in the Spent Fuel Pool would cease. Any further uncontrolled water level decrease beyond this point would indicate major problems with sealing areas, signifying a potential radiation dose consequence to plant personnel.

Thus, an ALERT Classification for this event is appropriate. Escalation, if appropriate, would occur via the Radiological Category or the Emergency Coordinator judgment.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Regulatory Guide 1.25, Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors, Rev. 0, 23 MAR 72
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Section 9.1.4.6
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Bechtel Calculation 13-NC-ZY-203, Fuel Handling Accident in the Fuel Building, Rev. 4
Combustion Engineering Study 14273-RCE-404, Implications of Cavity Seal Failure, Rev. 0
INPO SOER 85-01, Reactor Cavity Seal Failure
PVNGS Procedure 41AL-1PC01, Fuel Pool Cooling and Cleanup System Local Alarm Panel 1-J-PCN-E02 Responses, Rev. 03.03
PVNGS Procedure 41AO-1ZZ26, Irradiated Fuel Damage, Rev. 03.01
PVNGS Procedure 41AO-1ZZ53, Loss of Refueling Pool and/or Spent Fuel Pool Level, Rev. 02.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.52 3-14 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **SAE**

CATEGORY: **[A] Abnormal Rad Levels / Radiological Effluent**

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE,

3-14

1.5.53 3-14 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.54 3-15 (page 1 of 2)

APP MODE: MODES 1 - 6	***CLASS:*** SAE
CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent	

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE,

3-15

1.5.55 3-15 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.56 3-16 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.
3. Valid dose assessment capability indicates dose consequences greater than 100 mR whole body or 500 mR child thyroid.
4. Field survey results indicate site boundary dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 500 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation
OR
Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

3-16

1.5.57 3-16 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.58 3-17 (page 1 of 7)

APP MODE: MODES 1 - 6 *CLASS:* GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem Total Effective Dose Equivalent or 5 rem thyroid Committed Dose Equivalent. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-17

1.5.59 3-17 (page 2 of 7)

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The following calculation demonstrates that EALs of 2.2 μCi/cc on the Plant Vent monitor and 19.6 μCi/cc on the Fuel Building Vent monitor will produce, for a 1-hour exposure, EPA-400 PAG values of *(a)* 1 rem TEDE at the Site Boundary, or *(b)* 5 rem thyroid CDE, without exceeding the other EPA-400 PAG value. Under NUMARC/NESP-007, these values will be used as EALs for General Emergency. The corresponding EAL values for Site Area Emergency are 10% of the General Emergency values.

For the Fuel Building Vent monitor, a reading of 1.56E-03 μCi/cc or greater will cause an automatic reduction in flow rate of 43,500 cfm to a design value of 12,000 cfm *(provided both trains of essential ventilation are in operation)*. This concentration is one-half the EAL for Unusual Event. Therefore, a flow rate of 12,000 cfm will be used for this calculation. Bringing essential ventilation online also results in charcoal filtration of the Fuel Building Vent effluent, which consists of the ventilation exhausts from the Fuel Building as well as the Auxiliary Building below ground level. This filtration results in an Iodine reduction factor of 20, that is, a charcoal filter efficiency of 95%.

The design maximum flow rate for the Plant Vent is 111,000 cfm without the refueling purge in operation. Radiation Monitoring System *(RMS)* alarm setpoints do not reduce flow rate to the Plant Vent. Charcoal filtration is brought online through operator actions for the several flows to the Plant Vent which have a potential Iodine source term. This action provides an Iodine reduction factor of 20. RMS alarm setpoints and the EALs stated as concentrations in the Plant Vent exhaust and the Fuel Building Vent exhaust are based on noble gas concentration.

Based on the foregoing, the methodology of this calculation will be to calculate TEDE and thyroid CDE at the Site Boundary for a one-hour release with a default atmospheric dispersion coefficient *(c/Q = 8.91E-06 sec/m^3)*, which is the highest sector annual average c/Q value from the ODCM. The calculation for the Plant Vent release uses 2.2 μCi/cc noble gas for the accident type with the highest Iodine/noble gas *(I/NG)* ratio and 95% filter efficiency for Iodine. This process would then be repeated for releases from the Fuel Building Vent at 1.96E+01 μCi/cc.

1.5.60 3-17 (page 3 of 7)

TECHNICAL BASIS (continued...):

The Iodine/noble gas *(I/NG)* ratios at time = zero effective age are obtained from MESOREM, Jr.:

Plant Vent Releases I/NG

1. Isolated Containment *(100% LOCA / with iodine filtered)* 1.9E-02
2. Steam Generator Tube Rupture with 1% Failed Fuel 7.5E-05
3. Steam Generator Tube Rupture with 100% Failed Fuel 5.1E-04
4. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
5. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
6. Waste Gas Decay Tank Rupture 0
7. Fuel Handling Accident 2.5E-04

Fuel Building Vent Releases I/NG

1. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
2. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
3. Fuel Handling Accident 2.5E-04

For both vent pathways, the Loss of Coolant Accident *(LOCA)* with 100% Failed Fuel has the highest I/NG ratio *(maximum thyroid CDE)*. Noble gas release rate is fixed at the RMS reading specified *(Plant Vent = 2.2 µCi/cc, Fuel Building Vent = 19.6 µCi/cc)* multiplied by the process flow rate *(Plant Vent = 111,000 cfm, Fuel Building Vent = 12,000 cfm)*. The source term, in units of µCi/sec., is the same for both vent pathways, given these flow rates, concentrations, and this accident type *(i.e., 19.6/2.2 = 111,000/12,000)*.

Use of the LOCA with 100% Failed Fuel is consistent with PVNGS UFSAR Section 1.8, "Regulatory Guide 1.52 Response", in which this accident type is postulated for the design basis of the Control Building Essential Ventilation System. The same UFSAR Section also postulates the Fuel Handling Accident for the design basis of the Fuel Building Essential Ventilation System. By inspection of the above table, it can be seen that the Fuel Handling Accident has a lower I/NG ratio than the LOCA with 100% Failed Fuel. Therefore, given that the same accident type is limiting for both vent pathways, it is not necessary to calculate doses from both vents; they would be the same.

The source term or release rate is calculated in the following table per the equation:

Ci/sec = (µCi/cc) (ft^3/min) (472 cc/sec per ft^3/min) (1E-06 Ci/µCi)
= (µCi/cc) (1.07E+05) (472) (1E-06)
= (µCi/cc) (50.5)

1.5.61 3-17 (page 4 of 7)

TECHNICAL BASIS (continued...):

The isotopic mix at time = zero effective age is obtained from MESOREM, Jr.:

Nuclide	100% LOCA mix (%)	Source Term	Release Rate
(µCi/cc)	(Ci/sec.)		
I-131	12.1	6.0E-03	3.0E-01
I-132	12.4	6.0E-03	3.0E-01
I-133	24.8	1.2E-02	6.1E-01
I-134	27.1	1.3E-02	6.6E-01
I-135	23.6	1.1E-02	5.6E-01
Total Iodine	100.0	4.8E-02 *	2.4E+00
Kr-83m	0.0	0	0
Kr-85m	3.3	7.5E-02	3.8E+00
Kr-85	0.1	2.2E-03	1.1E-01
Kr-87	5.6	1.3E-01	6.6E+00
Kr-88	8.2	1.8E-01	9.1E+00
Kr-89	10.3	2.2E-01	1.1E+01
Xe-131m	0.1	2.2E-03	1.1E-01
Xe-133m	0.0	0	0
Xe-133	21.6	4.8E-01	2.4E+01
Xe-135m	6.1	1.4E-01	7.1E+00
Xe-135	5.1	1.1E-01	5.6E+00
Xe-137	20.0	4.4E-01	2.2E+01
Xe-138	19.6	4.3E-01	2.2E+01
Total NG	100.0	2.2E+00	1.1E+02

* Based on the I/NG ratio of 2.2E-02 and NG concentration of 2.2 µCi/cc

$CEDE_{inhalation} = \hat{A}_{i=1\ to\ n}\ (DCF)_i\ (c/Q)\ (Release\ Rate)_i$ (Unit Conversion)

where:

DCF_i = Dose Conversion Factor from EPA-400, Table 5-4, for nuclide "i", in rem-cc per µCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(Release\ Rate)_i$ is as was just calculated, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

1.5.62 3-17 (page 5 of 7)

TECHNICAL BASIS (continued...):

Nuclide	DCF_i	c/Q	Release Rate	$CEDE_i$
I-131	3.9E+04	8.91E-06	3.0E-01	1.0E-01
I-132	4.6E+02	8.91E-06	3.0E-01	1.3E-03
I-133	7.0E+03	8.91E-06	6.1E-01	3.8E-02
I-134	1.6E+02	8.91E-06	6.6E-01	9.4E-04
I-135	1.5E+03	8.91E-06	5.6E-01	7.5E-03
Noble Gases	0	8.91E-06	as given	0

$CEDE_{inhalation}$ = 1.5E-01 rem/hour

External EDE = $\hat{A}_{i=1 \text{ to } n}$ $(DCF)_i$ (c/Q) (Release Rate)$_i$ (Unit Conversion)

where:

DCF_i= Dose Conversion Factor from EPA-400, Table 5-3, for nuclide "i", in rem-cc per mCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

(Release Rate)$_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	External EDE_i
I-131	2.2E+02	8.91E-06	3.0E-01	5.9E-04
I-132	1.4E+03	8.91E-06	3.0E-01	3.7E-03
I-133	3.5E+02	8.91E-06	6.1E-01	1.9E-03
I-134	1.6E+03	8.91E-06	6.6E-01	9.4E-03
I-135	9.5E+02	8.91E-06	5.6E-01	4.7E-03
Kr-83m	0	8.91E-06	0	0
Kr-85m	9.3E+01	8.91E-06	3.8E+00	3.1E-03
Kr-85	1.3E+00	8.91E-06	1.1E-01	1.3E-06
Kr-87	5.1E+02	8.91E-06	6.6E+00	3.0E-02
Kr-88	1.3E+03	8.91E-06	9.1E+00	1.1E-01
Kr-89	1.2E+03	8.91E-06	1.1E+01	1.2E-01
Xe-131m	4.9E+00	8.91E-06	1.1E-01	4.8E-06
Xe-133m	1.7E+01	8.91E-06	0	0
Xe-133	2.0E+01	8.91E-06	2.4E+01	4.3E-03
Xe-135m	2.5E+02	8.91E-06	7.1E+00	1.6E-02
Xe-135	1.4E+02	8.91E-06	5.6E+00	7.0E-03
Xe-137	1.1E+02	8.91E-06	2.2E+01	2.2E-02
Xe-138	7.1E+02	8.91E-06	2.2E+01	1.4E-01

External EDE = 4.7E-01 rem/hour

1.5.63 3-17 (page 6 of 7)

TECHNICAL BASIS (continued...):

A "depleted c/Q" could be used for the Iodine isotopes; the resulting reduction in external EDE would be small.

In MESOREM Jr. Mode-A dose projections, CEDE is from inhalation only and external EDE is from immersion only; that is, CEDE from ingestion is calculated only in Mode-B, and external EDE from deposition is used only in PAG calculations and not EAL calculations. Particulate source term is also reserved for Mode-B projections. Therefore, for purposes of Initial Phase EALs:

TEDE = $CEDE_{Inhalation}$ + External EDE

= 1.5E-01 + 4.7E-01

= 6.2E-01 rem/hour

Conclusion 1:

Based on a Plant Vent concentration (noble gas) of 2.2 µCi/cc or a Fuel Building Vent concentration of 19.6 µCi/cc, the TEDE PAG is not reached for the postulated accident type.

The thyroid CDE will now be calculated for a Plant Vent concentration (noble gas) of 2.2 µCi/cc to show whether this proposed EAL value reaches or exceeds the thyroid CDE PAG.

CDE = $\hat{A}_{i=1 \text{ to } n}$ $(DCF)_i$ (c/Q) $(\text{Release Rate})_i$ (Unit Conversion)

where:

DCF_i = Dose Conversion Factor from EPA-400, Tables 5-2 and 5-4, for nuclide "i", in rem-cc per µCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(\text{Release Rate})_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	Thyroid CDE_i
I-131	1.3E+06	8.91E-06	3.0E-01	3.5E+00
I-132	7.7E+03	8.91E-06	3.0E-01	2.0E-02
I-133	2.2E+05	8.91E-06	6.1E-01	1.2E+00
I-134	1.3E+03	8.91E-06	6.6E-01	7.6E-03
I-135	3.8E+04	8.91E-06	5.6E-01	1.9E-01

Thyroid CDE = 4.9 rem/hour

1.5.64 3-17 (page 7 of 7)

TECHNICAL BASIS (continued...):

Conclusion 2:

Based on a Plant Vent concentration (noble gas) of 2.2 µCi/cc or a Fuel Building Vent concentration of 19.6 µCi/cc, the Thyroid CDE PAG is reached (a Plant Vent concentration of 2.3 µCi/cc would give a result slightly over 5.0 rem/hour) for the postulated accident type.

NOTE: External EDE rate, TEDE rate, and thyroid CDE rate are calculated using MESOREM, Jr. Total Body Dose rate is calculated using methodology in PVNGS Procedure 74RM-9EF41.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.65 3-18 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.

1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):

(site-specific list)

Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:

Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer

OR

Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary

OR

Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-18

1.5.66 3-18 (page 2 of 2)

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.67 3-19 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
3. Valid dose assessment capability indicates dose consequences greater than 1000 mR whole body or 5000 mR child thyroid.
4. Field survey results indicate site boundary dose rates exceeding 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 5000 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation
OR
Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*.

3-19

1.5.68 3-19 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.69 4-1

APP MODE: MODES 1 - 4	*CLASS:* NUE
CATEGORY: [S] System Malfunction ·	

NUMARC/NESP-007 INITIATING CONDITION:

SU5 RCS Leakage.
1. The following conditions exist:
a. Unidentified or pressure boundary leakage greater than 10 gpm.
OR
b. Identified leakage greater than 25 gpm.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unidentified or pressure boundary leakage > 10 gpm in Modes 1-4

Identified leakage > 25 gpm in Modes 1-4

LOCATION: Table 4: LEAKAGE / Row 1, Row 2

TECHNICAL BASIS:

This EAL is included as an NUE because it may be a precursor to more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified or pressure boundary leakage is selected as it is observable with normal Control Room indications. Lesser values must generally be determined through time-consuming surveillance tests *(e.g., mass balances)*. The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. Either value exceeded requires immediate classification *(i.e., Tech Spec LCO allowable Action Statement time limits are not applicable)*.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

4-1

1.5.70 5-1 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **NUE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU3 Unplanned Loss of Most or All Safety System Annunciation or Indication in The Control Room for Greater Than 15 Minutes
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. Compensatory non-alarming indications are available.
AND
c. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
d. Annunciator or Indicator loss does not result from planned action.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This and other related EALs are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.).*

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities. "Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-1

1.5.71 5-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

This EAL applies to Operating Modes 1-4 only, due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.72 5-2

APP MODE: MODES 1 - 4

CLASS: NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU2 Inability to Reach Required Shutdown Within Technical Specification Limits.
1. Plant is not brought to required operating mode within (site-specific) Technical Specifications LCO Action Statement Time.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Limiting Conditions of Operation *(LCOs)* require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by PVNGS Technical Specifications requires a one-hour report under 10 CFR 50.72*(b)*, Non-emergency events. The plant is within its safety envelope when being shut down within the allowable LCO Action Statement time limits in the Technical Specifications. An immediate Notification of Unusual Event is required when the plant is not brought to the required operating mode within the allowable LCO Action Statement time limits in the Technical Specifications. Declaration of an NUE is based on the time at which the LCO-specified Action Statement time period elapses under the PVNGS Technical Specifications and is not related to how long a condition may have existed. Other required Technical Specification shutdowns that involve precursors to more serious events are addressed by other specific EALs.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-2

1.5.73 5-3

APP MODE: MODES 1 - 6	***CLASS:*** NUE
CATEGORY: [S] System Malfunction	

NUMARC/NESP-007 INITIATING CONDITION:

SU6 Unplanned Loss of All Onsite or Offsite Communications Capabilities.
1. Either of the following conditions exist:
a. Loss of all (site-specific list) onsite communications capability affecting the ability to perform routine operations.
OR
b. Loss of all (site-specific list) offsite communications capability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Row 3: *Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio*

Row 4: *Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system*

LOCATION: Table 5: MALFUNCTIONS / Row 3, Row 4

TECHNICAL BASIS:

The purpose of this EAL is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate problems with offsite authorities. The loss of offsite communications ability is significantly more compre-hensive than the condition addressed by 10 CFR 50.72.

The offsite communications loss encompasses the loss of all means of communications with offsite authorities. This EAL is intended to be used only when extraordinary means are being utilized to make communications possible *(relaying of information from radio transmissions, individuals being sent to offsite locations, or any other method entailing communications with offsite authorities made possible from a location other than the Control Room / STSC).*

The onsite communications loss encompasses the loss of all means of routine communications.

NUMARC DEVIATION:

NONE. NUMARC/NESP-007 is not specific as to locations from which communications capabilities with offsite agencies are not possible. Since communications with offsite agencies are customarily originated from within the Control Room / STSC, PVNGS does not deviate from normal practices in this area.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-3

1.5.74 5-4 (page 1 of 2)

APP MODE: **MODES 1 - 2**

CLASS: **ALERT**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful.
1. (Site-specific) Indication(s) exist that indicate that reactor protection system setpoint was exceeded and automatic scram did not occur, and a successful manual scram occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2

(manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS bus from the Control Room)

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient and thus, the plant safety has been compromised and design limits of the fuel may have been exceeded. An ALERT is indicated because conditions exist that lead to potential loss of fuel clad or RCS. Under these conditions, the ALERT is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Reactor Protection System setpoint being exceeded *(rather than limiting safety system setpoint being exceeded)* is specified here because failure of the automatic protection system is the issue. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons)*. Failure of a manual trip would escalate the event to an SAE.

An ALERT classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

5-4

1.5.75 5-4 (page 2 of 2)

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.76 5-5 (page 1 of 2)

APP MODE: MODES 5 - 6

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA3 Inability to Maintain Plant in Cold Shutdown.
1. The following conditions exist:
a. Loss of (site-specific) Technical Specification required functions to maintain cold shutdown.
AND
b. Temperature increase that either:
w Exceeds Technical Specification cold shutdown temperature limit
OR
w Results in uncontrolled temperature rise approaching cold shutdown technical specification limit.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

This EAL addresses complete loss of functions required for core cooling during Refueling and Cold Shutdown Modes.

This condition is based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal. A number of phenomena such as pressurization, vortexing, steam generator U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system *(SDC)* design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncovery can occur. NRC analyses show that sequences can cause core uncovery in 15 to 20 minutes and severe core damage within an hour after decay heat removal is lost. Under these conditions, RCS integrity is lost and fuel clad integrity is lost or potentially lost, which is consistent with an SAE classification. Indicators used as measurement for this EAL are those methods used by the plant in response to Generic Letter 88-17, which include Core Exit Thermocouples *(CETs)* and RCS water level monitoring. In addition, Radiation Monitoring System *(RMS)* readings may also be appropriate as an indicator of this condition.

5-5

1.5.77 5-5 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Uncontrolled" means that the system temperature increase is not the result of planned actions by the plant staff.

The EAL guidance related to the uncontrolled temperature rise is necessary to preserve the anticipatory philosophy of NUREG-0654 for events starting from temperatures much lower than the Cold Shutdown temperature limit.

NUMARC DEVIATION:

It is understood that if the plant is in conformance with Technical Specifications during operations within Cold Shutdown conditions, any functions required for OPERABILITY during this mode will be available to maintain Cold Shutdown. Hence, "Technical Specification required functions", as delineated in the NUMARC Example EAL, is redundant to that required for the specific mode and will be available for maintaining conditions required for that mode.

The Cold Shutdown temperature limit has been applied to the PVNGS EAL as a temperature of 210°F, which is the PVNGS Technical Specification upper temperature bounds of the modes applicable to this EAL.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.78 5-6 (page 1 of 2)

APP MODE: MODES 1 - 4	*CLASS:* ALERT
CATEGORY: [S] System Malfunction	

NUMARC/NESP-007 INITIATING CONDITION:

SA4 Unplanned Loss of Most or All Safety System Annunciation or Indication in Control Room With Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable.
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
c. Annunciator or Indicator loss does not result from planned action.
AND
d. Either of the following:
1. A significant plant transient is in progress.
OR
2. Compensatory non-alarming indications are unavailable.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL is intended to provide recognition of the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a transient. Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.)*.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities.

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

5-6

1.5.79 5-6 (page 2 of 2)

TECHNICAL BASIS (continued...):

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment. If both a major portion of the annunciation system and all computer monitoring are not available to the extent that the additional operating personnel are required to monitor indications, the ALERT is required.

Due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes, no EAL is indicated for these modes of operation.

This ALERT will be escalated to an SAE if the operating crew cannot monitor the transient in progress.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.80 5-7 (page 1 of 2)

APP MODE: **MODES 1 - 2** ***CLASS:*** **SAE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful.
1. (Site-specific) indications exist that automatic and manual scram were not successful.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. An SAE is indicated because conditions exist that lead to imminent loss or potential loss of both fuel clad and RCS. Under these conditions, the SAE is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Although this EAL may be viewed as redundant to the Fission Product Barrier Reference EAL, its inclusion is necessary to better assure timely recognition and emergency response. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons).*

A Site Area Emergency classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

5-7

1.5.81 5-7 (page 2 of 2)

NUMARC DEVIATION (continued...):

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.82 5-8

APP MODE: MODES 5 - 6 | ***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS5 Loss of Water Level in the Reactor Vessel That Has or Will Uncover Fuel in the Reactor Vessel.
1. Loss of Reactor Vessel Water Level as indicated by:
a. Loss of all decay heat removal cooling as determined by (site-specific) procedure.
AND
b. (Site-specific) indicators that the core is or will be uncovered.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 4xAO-xZZ22; Safety Analysis Operational Data)

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Under the conditions specified by this EAL, severe core damage can occur and Reactor Coolant System integrity may not be assured. This EAL covers sequences such as prolonged boiling following loss of decay heat removal. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

Site-specific indicators are not detailed in the EAL due to procedural direction delineating specific indications to be used in the assessment of reactor vessel water level. The Abnormal Operating Procedure also references the PVNGS Safety Analysis Operational Data Document to determine the associated core conditions based on time shutdown, vessel level, makeup flow rate, and core decay heat load.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ22, Loss of Shutdown Cooling, Rev. 06.14
PVNGS Safety Analysis Operational Data, Rev. 0
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-8

1.5.83 5-9

APP MODE: MODES 1 - 4	CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS4 Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown.
1. Complete loss of any (site-specific) function required for hot shutdown.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function (i.e., heat removal, reactivity control) or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL addresses complete loss of functions, including the ultimate heat sink and reactivity control, which are required to achieve or maintain Hot Shutdown. The Heat Removal Safety Function encompasses systems associated with removing heat from the core following plant shutdown, such as steam generators, which are required to be fed and steamed to be Operable, and the Shutdown Cooling System, which is required when steam generators are no longer needed or are unavailable for heat removal. The Reactivity Control Safety Function relies on shutdown margin requirements to ensure an unanticipated criticality situation does not occur, jeopardizing the RCS pressure boundary and possibly leading to core damage. Under these conditions, there is an actual major failure of a system intended for protection of the public. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.84 5-10 (page 1 of 2)

APP MODE: MODES 1 - 4

CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS6 Inability to Monitor a Significant Transient In Progress.
1. The following conditions exist:
a. Loss of (site-specific) annunciators associated with safety systems.
AND
b. Compensatory non-alarming indications are unavailable.
AND
c. Indications needed to monitor (site-specific) safety functions are unavailable.
AND
d. Transient in progress.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available

LOCATION: Table 5: MALFUNCTIONS / Row 4

TECHNICAL BASIS:

This EAL and its associated EALs are intended to recognize the inability of the Control Room staff to monitor the plant response to a transient. An SAE is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor/Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-10

1.5.85 5-10 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

Indications needed to monitor safety functions necessary for protection of the public includes Control Room indications, computer generated indications *(i.e., QSPDS)*, and dedicated annunciation capability. The specific indications are those used to determine such functions as the ability to shut down the reactor, maintain the core cooled and in a coolable geometry, to remove heat from the core, to maintain the Reactor Coolant System intact, and to maintain containment integrity.

"Planned" actions are excluded from this EAL since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not an ameliorating factor.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system would audibly annunciate and the text associated with a particular parameter would change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it would also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.86 5-11 (page 1 of 2)

APP MODE: MODES 1 - 2 ***CLASS:*** GE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG2 Failure of the Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is Indication of an Extreme Challenge to the Ability to Cool the Core.
1. (Site-specific) indications exist that automatic and manual scram were not successful.
AND
2. Either of the following:
a. (Site-specific) indications exist that the core cooling is extremely challenged.
OR
b. (Site-specific) indications exist that heat removal is extremely challenged.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to complete an automatic reactor shutdown (i.e., subcritical) and manual shutdown was not successful when in Modes 1-2
AND
CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons)*.

Under the conditions of this and associated EALs, the efforts to bring the reactor subcritical have been unsuccessful and, as a result, the reactor is producing more heat than the maximum decay heat load for which the safety systems were designed. Although there are capabilities away from the reactor control console, such as emergency boration, the continuing temperature rise indicates that these capabilities are not effective. This situation could be a precursor for a core melt sequence.

The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200°F or that the reactor vessel water level is below the top of the active fuel.

5-11

1.5.87 5-11 (page 2 of 2)

TECHNICAL BASIS (continued...):

Another consideration is the inability to initially remove heat during the early stages of this sequence. If Essential Auxiliary Feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist.

In the event either of these challenges exist at a time that the reactor has not been brought below the power associated with the safety system design *(typically 3%)*, a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the GE declaration is intended to be anticipatory of the Fission Product Barrier Reference declaration to permit maximum offsite intervention time.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

1.5.88 6-1

APP MODE: MODES 1 - 6 *CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU2 Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection.
1. Fire in buildings or areas contiguous to any of the following (site-specific) areas not extinguished within 15 minutes of control room notification or verification of a control room alarm.
w (Site-specific) list

PVNGS EMERGENCY ACTION LEVEL (EAL):
Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:
The purpose of this EAL is to address the magnitude and extent of fires that may be potentially significant precursors to damage to safety systems. This excludes such items as fires within administration buildings, waste-basket fires, and other small fires of no safety consequence. This EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or areas that are not contiguous or immediately adjacent to plant vital areas. Verification of the alarm, in this context, means those actions taken in the Control Room to determine that the Control Room alarm is not spurious.

NUMARC DEVIATION:
Site-specific areas are not delineated in the PVNGS EAL due to the ramifications involved when a fire affects the Protected Area. Because PVNGS is a three-unit site, and because a listing of specific areas which could be affected by a fire within buildings and/or areas immediately contiguous to this site-specific listing would defeat the purpose of possessing the ability to determine if the fire is affecting the Protected Area, the Shift Supervisor / Emergency Coordinator will be better served when a determination has to be made at the time whether the Protected Area is affected or not. The term "affecting major structures or areas within the Protected Area" is used here in the same context as is used elsewhere within the "HAZARDS" Event Category.

The 15 minute time period for a fire to be extinguished prior to declaration, in itself, allows for the exclusion of extremely small fires *(i.e., waste-basket fires, etc.)* which are easily extinguished, and sets a measurable standard which recognizes that any increase in the length of time a fire burns increases the risk of damage to equipment or injury to plant personnel.

A site-specific listing of possible Control Room annunciators that may be relevant to the diverse set of related fires appropriate to this EAL is not included within the text of the EAL due to procedural direction within the Control Room involving priorities established for operator response within those procedures. The annunciator responses *(several hundred, each specific to a designated area or component)* established for the Fire Alarm Terminal CRT are used in conjunction with the Pre-Fire Strategies Manual by Control Room and Fire Protection personnel in assessing and responding to fires within the facility.

SOURCE DOCUMENT:
PVNGS Pre-Fire Strategies Manual, Rev. 6
Fire Point/Zone Alarm Book
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-1

1.5.89 6-2

APP MODE: MODES 1 - 6	CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
5. Report by plant personnel of an unanticipated explosion within protected area boundary resulting in visible damage to permanent structure or equipment.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Explosion affecting the Protected Area resulting in visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

The Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04.

Only those explosions of sufficient force to damage permanent structures or equipment within the Protected Area are considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The SS / EC also needs to consider any security aspects of the explosion, if applicable.

NUMARC DEVIATION:

NONE. The grammatical structure of the EAL lends itself to visible damage as reported by site personnel.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-2

1.5.90 6-3

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
4. Vehicle crash into plant structures or systems within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile that may potentially damage plant structures containing functions and systems required for safe shutdown of the plant. The event is escalated to an ALERT if the crash is confirmed to affect a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems within the Protected Area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-3

1.5.91 6-4

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU3 Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant.
1. Report or detection of toxic or flammable gases that could enter within the site area boundary in amounts that can affect normal operation of the plant.
2. Report by Local, County, or State Officials for potential evacuation of site personnel based on offsite event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on releases in concentrations within the Site Boundary that will affect the health of plant personnel or affecting the safe operation of the plant with the plant being within the evacuation area of an offsite event *(i.e., tanker truck accident releasing toxic gases, etc.)*. In the latter case, the evacuation area will be as determined from the DOT Evacuation Tables for Selected Hazardous Materials, located in the DOT Emergency Response Guide for Hazardous Materials.

NUMARC DEVIATION:

The EAL does not address toxic or flammable gas origins or causes for evacuations of personnel located within the Site Area Boundary due to an offsite event. Gases that could enter the Site Boundary encompass causes for evacuation. The EAL addresses the impact to personnel and the safe operation of the plant, regardless of the origin of these evacuation directives.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-4

1.5.92 6-5

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
6. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals

LOCATION: Table 6: HAZARDS / Row 5

TECHNICAL BASIS:

This EAL is intended to address main turbine rotating component failure of sufficient magnitude to cause observable damage to the turbine casing or to the seals of the turbine generator. Of major concern is the potential for leakage of combustible fluids *(lubricating oils)* and gases *(hydrogen cooling)* to the plant environs. Actual fires and flammable gas build-up are appropriately classified via HU2 and HU3. This EAL is consistent with the definition of an NUE while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment.

NUMARC DEVIATION:

"Turbine oil seals" is indicated to clarify the intent of the EAL. Damage to the turbine casing is determined by visual and/or indicated observations from the Control Room *(i.e., visual CRT display of turbine bearing vibrations and condenser vacuum indicators).* Sufficient instrumentation exists to adequately determine turbine failures involving seal failures which conform to the intent of this EAL. A reliance is implied, though, for visual damage indications by plant personnel.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.93 6-6

APP MODE: MODES 1 - 6	CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
1. (Site-specific) method indicates felt earthquake.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid "Strong Motion Accelerometer System Trigger" indicated on Seismic Warning Panel per 79IS-9SM01

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL references PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, which is performed by the Shift Technical Advisor upon receipt of a "SEISMIC OCCURRENCE" Control Room annunciation. Under the intent of this EAL, damage may be caused to some portions of the site, but should not affect ability of safety functions to operate. The method of detection is based on instrumentation and validated by the aforementioned procedure. As defined in the EPRI-sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, a "felt earthquake" is:

An earthquake of sufficient intensity such that : *(a)* the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and *(b)* for plants with operable seismic instrumentation, the seismic switches of the plant are activated. For most plants with seismic instrumentation, the seismic switches are set at an acceleration of about 0.01g.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-6

1.5.94 6-7

APP MODE: **MODES 1 - 6**	***CLASS:*** **NUE**
CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
2. Report by plant personnel of tornado striking within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Tornado affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the assumption that a tornado striking *(touching down)* within the Protected Area Boundary may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. If such damage is confirmed visually or by other in-plant indications, the event will be escalated to an ALERT.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-7

1.5.95 6-8

APP MODE: MODES 1 - 6	***CLASS:*** NUE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
7. (Site-Specific) Occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-8

1.5.96 6-9

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA2 Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown.
1. The following conditions exist:
a. Fire or explosion in any of the following (site-specific) areas:
w (Site-specific) list
AND
b. Affected system parameter indications show degraded performance or plant personnel report visible damage to permanent structures or equipment within the specified area.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:
Equipment and plant areas required for the current operating Mode are delineated in PVNGS Technical Specifications. As such, a determination can be made if the fire or explosion is potentially affecting one or more redundant trains of safety systems which are required to be OPERABLE for the current operating Mode. With regard to explosions, only those explosions of sufficient force to damage permanent structures or equipment required for safe operation within the identified plant area should be considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. The inclusion of a "report of visible damage" should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The declaration of an ALERT and the activation of the TSC will provide the Emergency Operations Director *(EOD)* with the resources needed to perform these damage assessments. The EOD also needs to consider any security aspects of the explosion*(s)*, if applicable.

NUMARC DEVIATION:
Specifying "plant areas and equipment required for the current operating Mode" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of functions and systems applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details functions and systems required to be OPERABLE for applicable Modes.

SOURCE DOCUMENT:
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-9

1.5.97 6-10

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA5 Control Room Evacuation Has Been Initiated.
1. Entry into (site-specific) procedure for control room evacuation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Entry into 4xAO-xZZ27 or 4xAO-xZZ44 for Control Room evacuation

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

With the Control Room evacuated, additional support with monitoring and direction through the Technical Support Center and/or Emergency Operations Facility is necessary. Inability to establish plant control from outside the Control Room will escalate this event to an SAE.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-10

1.5.98 6-11

APP MODE: **MODES 1 - 6**

CLASS: **ALERT**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
5. Vehicle crash affecting plant vital areas.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact affecting plant vital areas

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile affecting a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems affecting a plant vital area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-11

1.5.99 6-12

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
3. Report of any visible structural damage on any of the following plant structures:
w Reactor Building
w Intake Building
w Ultimate Heat Sink
w Refueling Water Storage Tank
w Diesel Generator Building
w Turbine Building
w Condensate Storage Tank
w Control Room
w Other (Site-Specific) Structures

PVNGS EMERGENCY ACTION LEVEL (EAL):

Visible structural damage to any building containing safe shutdown equipment

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL addresses structures containing systems and functions required for safe shutdown of the plant. The structural damage implied has origins related to any destructive phenomena not explicitly addressed in any other EAL in this category.

NUMARC DEVIATION:

Specifying "any building containing safe shutdown equipment" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of plant structures and buildings applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details plant structures and buildings required to be OPERABLE for applicable Modes as delineated within Limiting Conditions for Operation *(LCOs)* requiring Operability for all supporting equipment and functions needed for Operability of the applicable system or function.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-12

1.5.100 6-13

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA3 Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown.

1. Report or detection of toxic gases within a Facility Structure in concentrations that will be life threatening to plant personnel.
2. Report or detection of flammable gases within a Facility Structure in concentrations that will affect the safe operation of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on gases that have entered a plant structure affecting the safe operation of the plant. The EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or other areas that are not contiguous or immediately adjacent to plant vital areas. It is appropriate that increased monitoring be done to ascertain whether consequential damage has occurred. The PVNGS site Fire Department operates under OSHA guidelines in determining if facility structures meet habitability requirements. They are staffed continuously and are trained and required to respond to hazardous materials, hazardous atmospheres, etc.

NUMARC DEVIATION:

This EAL has been phrased to allow for the inclusion of safe plant operations encompassing both plant personnel and safety systems required for the current operating Mode. Equipment required for the establishment and maintenance of Cold Shutdown is required to be OPERABLE in Modes specifying the applicability.

SOURCE DOCUMENT:

PVNGS Procedure 14AC-0FP02, Emergency Notification and Response, Rev. 02.02
PVNGS Procedure 14DP-0FP27, PVNGS Fire Department Hazardous Incident Response, Rev. 00.00
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-13

1.5.101 6-14

APP MODE: MODES 1 - 6 — ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
6. Turbine failure generated missiles result in any visible structural damage to or penetration of any of the following plant areas: (site-specific) list.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL is intended to address the threat to safety related equipment imposed by missiles generated by main turbine rotating component failures. Since PVNGS was designed to minimize impacts to safety related equipment caused by main turbine rotating component failures *(i.e., no safety related equipment is located on a tangent to turbine rotational direction)*, there are no areas within which damage to structures containing this equipment can be affected by ejected turbine components. Catastrophic failure of the main turbine rotating components, though, would likely cause damage to the main condenser, condensate and/or circulating water system*(s)* piping, or personnel in the vicinity. However, this EAL is consistent with the definition of an ALERT in that if missiles have damaged or penetrated areas containing safety related equipment, the potential exists for substantial degradation of the level of safety of the plant.

NUMARC DEVIATION:

No listing of structures containing safety related equipment specific to PVNGS is included in the EAL due to the inherent characteristics of the manufacturers' design of the plant *(i.e., Bechtel, Combustion Engineering)*. No safety related equipment is located on a tangent to the rotational direction of the main turbine spindles.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-14

1.5.102 6-15

APP MODE: MODES 1 - 6	CLASS: ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
1. (Site-Specific) method indicates Seismic Event greater than Operating Basis Earthquake (OBE).

PVNGS EMERGENCY ACTION LEVEL (EAL):

Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Seismic events of this magnitude can cause damage to safety functions. The determination of the magnitude of the seismic event is based on preliminary analysis by the Shift Technical Advisor that the OBE annunciation is valid. The event classification can then be declared in a prompt manner. Performance of 79IS-9SM01, Analysis of Seismic Event, by the STA upon receipt of "SEISMIC OCCURRENCE" Control Room annunciation is then performed as appropriate to the indications.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
PVNGS Updated Final Safety Analysis Report (UFSAR), Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-15

1.5.103 6-16

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
2. Tornado or high winds striking plant vital areas: Tornado or high winds greater than (site-specific) mph strike within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Wind loads of this magnitude can cause damage to safety functions. Sustained winds of > 105 mph or tornados with cyclonic velocities exceeding 260 mph *(Category F5)* with simultaneous tangential movement of 40 mph *(i.e., 260 + 40 = 300 mph)* are design levels per the PVNGS FSAR. Sustained winds are wind speeds averaged over one minute that generally remain continuous for at least 15 minutes *(NOAA-NWS definition)* and exclude localized gusts exceeding these wind velocity limits.

NUMARC DEVIATION:

NONE. "Sustained" winds are based on National Weather Service *(NWS)* forecasts and/or warnings issued locally. Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, meteorological tower data should not be used for weather assessments regarding wind velocities of this force for emergency classification purposes. Estimated sustained winds furnished by the National Weather Service should provide the basis for emergency classification purposes. EAL HA1-3 will provide evidence of damage to safe shutdown structures when winds of this nature are exceeded.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

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1.5.104 6-17

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
7. (Site-Specific) occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding potentially affecting safety systems required for the current operating Mode

LOCATION: Table 6: HAZARDS / Row 9

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation. The effect that flooding of this extent could have on "safety systems required for the current operating Mode" is consistent with other hazards and naturally occurring events of this type.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-17

1.5.105 6-18

APP MODE: **MODES 1 - 6** — ***CLASS:*** **SAE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HS2 Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established.
1. The following conditions exist:
a. Control room evacuation has been initiated.
AND
b. Control of the plant cannot be established per (site-specific) procedure within (site-specific) minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

Expeditious transfer of safety systems has not occurred but fission product barrier damage may not yet be indicated. PVNGS Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix R Operational Considerations, establishes 23 minutes for initiating Auxiliary Feedwater to the steam generator*(s)* as the most limiting initial action which must be taken under these conditions. However, the 15 minute time period established generically for transfer of safety system control to the Remote Shutdown Panel*(s)* is based on an assessment as to how quickly control must be re-established without core uncovering and/or core damage possibly taking place. *(Based on the generic basis, this time period must never exceed 15 minutes.)* In Cold Shutdown and Refueling Modes, operator concern is directed toward maintaining core cooling such as is discussed in Generic Letter 88-17, Loss of Decay Heat Removal. In power operation, Hot Standby, and Hot Shutdown Modes, operator concern is primarily directed toward maintaining critical safety functions and thereby assuring fission product barrier integrity.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50 Appendix R Operational Considerations, 29 JUL 93
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside the Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-18

1.5.106 7-1

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU4 Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant.

1. Bomb device discovered within plant protected Area and outside the plant Vital Area.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

This EAL is based on the PVNGS Site Security Plan. Security events which do not represent at least a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 or, in some cases, under 10 CFR 50.72. The plant Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04. A bomb discovered in the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Color Code Condition - Red *(Security Emergency).*

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-1

1.5.107 7-2

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA4 Security Event in a Plant Protected Area.
1. Intrusion into plant protected area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within the Protected Area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

The Control Room Shift Supervisor should declare this EAL when there is direct evidence that hostile forces are or have been inside the Protected Area, but the Control Room or any vital area are not currently threatened. The Shift Supervisor should also consider this EAL in situations where the presence of hostile forces within the Protected Area is indicated by sabotage to plant equipment, but the full extent of damage to equipment or the full scope of the sabotage may not yet be known. This class of security events represents an escalated threat to plant safety above that contained in the NUE. For the purposes of this EAL, a civil disturbance which penetrates the Protected Area Boundary can be considered a hostile force and, as such, the intrusion of this hostile force into the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-2

1.5.108 7-3

APP MODE: MODES 1 - 6 *CLASS:* SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS1 Security Event in a Plant Vital Area.
1. Intrusion into plant vital area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within any vital area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Hostile forces consist of one or more persons armed with any sort of weapon*(s)* whose intent is evident by declaration or action to cause damage to plant equipment or injury to plant personnel. The principal role in dealing with a security threat belongs to the security forces. The role of the operator is to ensure to the maximum extent possible under the circumstances that the health and safety of the public is protected. Entry of hostile forces inside the protected area compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. Hostile forces may seek to damage plant equipment and cause a release, or injure or kill plant operating staff. Situations where hostile forces are known to have entered the Protected Area places the Control Room, Remote Shutdown Panels, or other areas defined as vital in the unit security plans at extreme and immediate risk. Entry of hostile forces inside the protected area undoubtedly constitutes a situation in which there is an actual or potential substantial degradation in the level of plant safety. This class of security events represents an escalated threat to plant safety above that contained in the ALERT in that a hostile force has progressed from within the Protected Area to a vital area.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-3

1.5.109 7-4

APP MODE: MODES 1 - 6	***CLASS:*** GE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HG1 Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown.
1. Loss of physical control of the control room due to security event.
2. Loss of physical control of the remote shutdown capability due to security event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Entry of hostile forces into the Control Room or Remote Shutdown Panel Room*(s)* compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. If the hostile forces are known to have entered the Control Room or Remote Shutdown Panel Room*(s)* or other vital plant areas, the freedom of operators to maintain the plant in a safe operating condition is lost. This EAL encompasses conditions under which a hostile force has taken physical control of the Control Room, Remote Shutdown Panel Room*(s)*, or any other vital area required to reach and maintain safe shutdown conditions. Although actual core melt or loss of containment integrity has not occurred and there is no immediate evidence of substantial releases in progress, control of the reactor plant by hostile forces undoubtedly constitutes the most serious possible threat.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-4

1.5.110 8-1

APP MODE: **MODES 1 - 6** | ***CLASS:*** **NUE**

CATEGORY: **[H] Hazards and Other Conditions Affecting Plant Safety**

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
3. Assessment by the control room that an event has occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting the Protected Area

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(i.e., an earthquake is felt but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-1

1.5.111 8-2

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU5 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event.
1. Other indications exist which in the judgment of the Emergency Director indicate a potential degradation of the level of safety of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate a potential degradation of the level of safety of the plant

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:
This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the NUE emergency class.

From a broad perspective, one area that may warrant SS/EC judgment is related to likely or actual breakdown of PVNGS event mitigating actions. Examples to consider include inadequate emergency response procedures *(e.g., Emergency Plan Implementing Procedures, etc.)*, transient response either unexpected or not understood, failure or unavailability of emergency systems during an accident in excess of that assumed in accident analyses, or insufficient availability of equipment and/or support personnel.

Specific examples of actual events that may require SS/EC judgment for an NUE declaration are listed below for consideration. However, this list is by no means all inclusive and is not intended to limit the discretion of the SS/EC judgment in applying further examples.

w Aircraft crash on site
w Train derailment on site
w Near-site explosion which may adversely affect normal site activities
w Near-site release of toxic or flammable gas which may adversely affect normal site activities
w Uncontrolled RCS cooldown due to secondary side depressurization

It is also intended that the SS/EC judgment not be limited by any list of events as defined here or as augmented by the site. This list is provided solely as examples for consideration and it is recognized that actual events may not always follow a pre-conceived description.

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-2

1.5.112 8-3

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
4. (Site-Specific) Indications in the control room.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting plant vital areas

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(e.g., an earthquake is believed to exceed OBE levels but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-3

1.5.113 8-4

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA6 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert.

1. Other indications exist which in the judgment of the Emergency Director indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the ALERT emergency class. If the SS/EC believes that increased monitoring of plant functions is warranted and deems that activation and staffing of Emergency Response Facilities is required for this monitoring, then the ALERT declaration is warranted.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.114 8-5

APP MODE: MODES 1 - 6	*CLASS:* SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS3 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate actual or likely major failures of plant functions needed for protection of the public.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate actual or likely major failure of plant functions needed for protection of the public

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the emergency class description for SAE.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-5

1.5.115 8-6

APP MODE: MODES 1 - 6	*CLASS:* GE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HG2 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate: *(1)* actual or imminent substantial core degradation with potential for loss of containment, or *(2)* potential for uncontrolled radionuclide releases. These releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the site boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate:

(1) actual or imminent substantial core degradation with potential for loss of CTMT, or
(2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the GE class.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-6

Appendix R - Dose Projection Technical Bases

1.0 DOSE PROJECTION TECHNICAL BASES

1.1 Introduction

1.1.1 This document provides various supporting information related to dose assessment activities above and beyond that available in the instructions for Dose Projection, Protective Actions, and the Emergency Exposure/KI. It is intended to be used primarily by the EOF Staff.

1.1.2 This section contains the following subsections:

1.1.2.1 Aids to project dose in an un-monitored release situation. Typical situations where this information may be useful would be a fire (outdoors or in a building) where the release is directly to atmosphere (un-filtered). Other situations might involve a release from the Fuel Building or Auxiliary Building due to an open door or breach; or an outdoor large storage tank being vented directly to atmosphere.

1.1.2.2 The modeled accidents in Mesorem Jr. utilize "standard" and default data in order to expedite the release projection. This section provides information to fine tune a projection by adjustment of various entries. Also provided is detailed accident specific information which may be requested by ARRA or the NRC.

1.1.2.3 Mesorem Jr. can be used to provide additional information beyond the initial dose projections; such as using a completed grab sample analysis to verify a projection, or assigning an important offsite location an individual receptor point. This section covers some selected options in those areas.

1.1.2.4 Source Term Monitoring general information and job aids are provided.

1.1.2.5 Control of dose must be done on a TEDE basis rather than relying on Whole Body dose. Until completed airborne sample data is available, the CEDE component of the TEDE will be unknown. This section provides information on how to use the External EDE and TEDE projected doses from the Mesorem Jr. printout to determine the expected ratio.

1.1.2.6 A methodology to adjust a Mesorem Jr. projection to actual field readings is provided.

1.1.2.7 General RMS information is provided.

1.2 Isolated Containment supporting information

1.2.1 The accident assumption is that a LOCA is occurring inside an isolated containment; with the release being the summed leakage to atmosphere from all of the containment penetrations (even though the penetrations are for the most part in the Aux. Bldg.). This selection may be used for any accident causing airborne activity in an Isolated Containment. The release calculation is based on a correlation of airborne activity to the higher of the RU-148/149 readings.

1.2.1.1 Mesorem requires Rem/hr values for RU-148/149; DO NOT INPUT mRem/hr.

1.2.1.2 Note that a failed fuel situation may cause elevated readings on these monitors even though there is no airborne activity in containment to be released.

1.2.1.3 As the typical leakage is small, extreme monitor levels are needed to result in a significant release.

1.2.2 RU-148/149 correlation reading

1.2.2.1 If RU-148/149 are Inoperable, (or suspect) a calculation has been performed and a chart made (Page 5 this section) such that readings from any of several RU monitors outside containment may be used to correlate to a RU-149 level. Closed Window dose rates taken at the alternate detector geometry may be substituted if available.

1.2.3 Containment Leak Rate

1.2.3.1 The default leakage is assumed to be 852 cc/sec per FSAR Section 6.2.1, Table 6.2.1-3, "Principal Containment Design Parameters"; the containment design level leak rate is 0.1% of the free volume per day at 60 PSIG with a containment free volume of 2.6E6 Cubic Feet (7.36E10 Cubic Centimeters).

1.2.3.2 Increasing Leak Rates per time

0.1	% per day	8.52 E2 cc/sec	(Default)
1.0	% per day	8.52 E3 cc/sec	
0.1	% per hour	2.04 E4 cc/sec	
10	% per day	8.52 E4 cc/sec	
1.0	% per hour	2.04 E5 cc/sec	
100	% per day	8.52 E5 cc/sec	
10	% per hour	2.04 E6 cc/sec	
100	% per hour	2.04 E7 cc/sec	

1.2.3.3 Actual Leak Rates will be difficult for the Technical Staff to determine during an event; ask for bounding estimates within the above alternates.

1.2.4 Basis of mix used for MESOREM projection

1.2.4.1 Reg Guide 1.4, "Assumptions used for evaluating the potential radiological consequences of a loss of coolant accident for pressurized water reactors" calls for the following assumptions to be made by license applicants:

- 25% of the Iodine inventory should be assumed to be available for leakage.
- 100% of the Noble Gas inventory should be assumed to be available - a reduction of the amount of material available for leakage may be taken for containment spray effects, but the amount of reduction should be evaluated on an individual case basis (there is no built-in Mesorem adjustment for this).
- FSAR 6.5.2.2 states that only 6% of the containment volume is unsprayed.

1.2.4.2 For the first 24 hours of an accident, the containment leak rate should assume Technical Specification leak rate at peak accident pressure.

1.2.5 ARRA/NRC - Both groups have procedural requirements which require more data. To be prepared to answer questions the below may be reviewed.

1.2.5.1 Is 20% or greater Core Damage projected or in progress?

- The Mesorem projection will provide an estimated Core Damage Fraction (CDF) in percent. This will not equate readily with the NRC Categories of Fuel Failure, but will provide an indication of the amount of core damage. Provide Tech Staff with the CDF given by Mesorem, and have them determine estimated damage.

1.2.5.2 Will the inventory in Containment exceed the PAGs if released at a 100% per day leak rate?

- The projection dose rate and dose values based on an 852 cc/sec leak rate are multiplied by 1000 to obtain 100% release per day values; and by 24,000 to obtain 100% release per hour values.

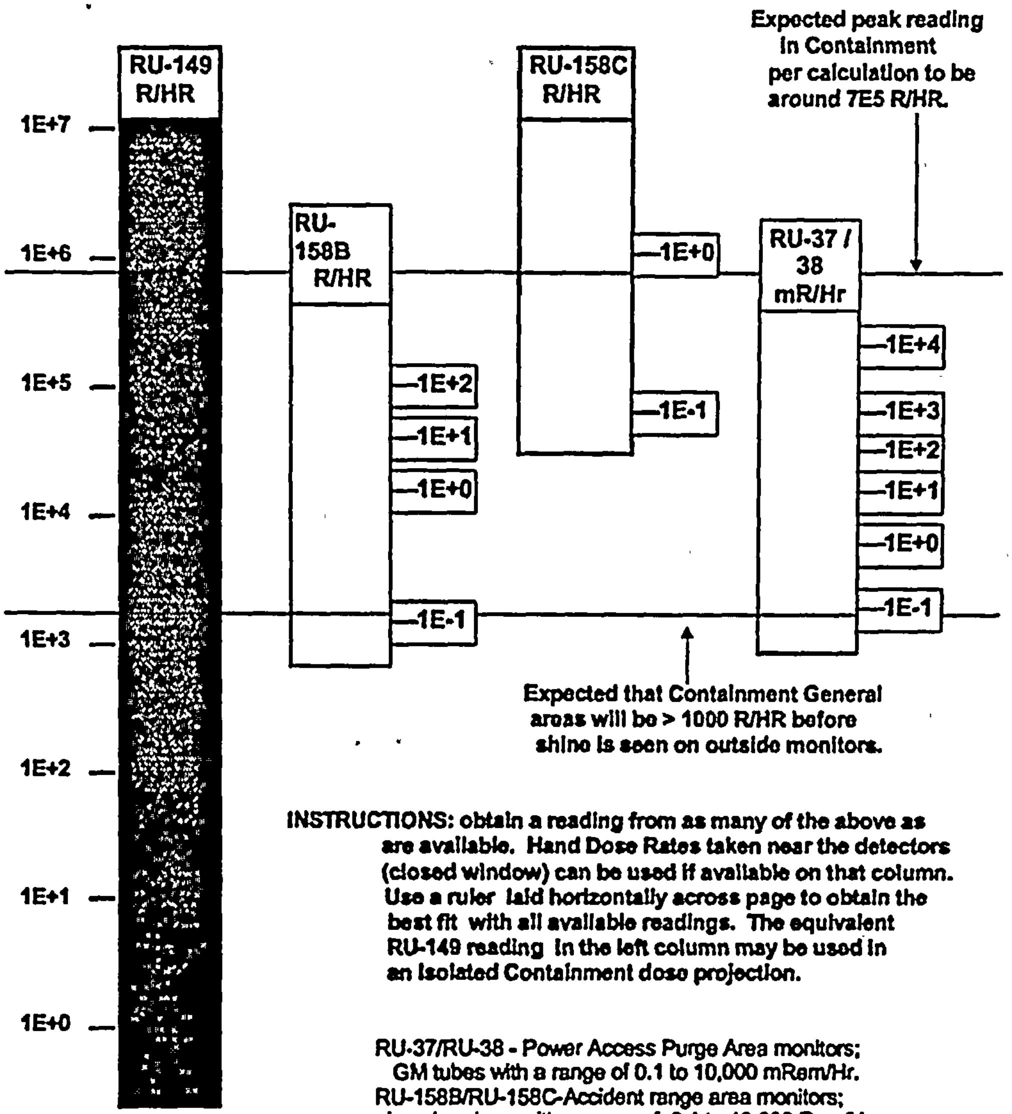
1.2.5.3 What is the expected dose at Site Boundary if the leak rate increases by a factor of 10 or 100?

- If RU-148 has the same reading when the leak rate increases by a factor of ten, the projected Site Boundary dose will also increase by a factor of 10.

1.2.6 The following table provides a visual idea of the RU-148 levels required to obtain similar Site Boundary Dose rates as leak rates vary. The calculations reflect the RU-148 readings that would meet the EAL 3-16 and 3-19 levels. These are worst case scenario calculations done with default met data, shortest distance to Site Boundary, etc.

Leak Rate from Containment	RU-148 in Rem/hr	EAL 3-16 Criteria met @Site Boundary	EAL 3-19 Criteria met @Site Boundary
100%/Day	80	100 mRem/hr TEDE	
(8.52E5 cc/sec)	500		1 Rem/hr TEDE
10%/Day	500	100 mRem/hr TEDE	
(8.52E4 cc/sec)	2800		1 Rem/hr TEDE
1%/Day	2800	100 mRem/hr TEDE	
(8.52E3 cc/sec)	13,300		5 Rem/hr Thyroid CDE
.1%/Day	13,300	500 mRem/hr Thyroid CDE	
(8.52E2 cc/sec)	36,500		5 Rem/hr Thyroid CDE

1.2.7 CONTAINMENT DOSE RATE ESTIMATION USING AREA MONITORS EXTERNAL TO CONTAINMENT



INSTRUCTIONS: obtain a reading from as many of the above as are available. Hand Dose Rates taken near the detectors (closed window) can be used if available on that column. Use a ruler laid horizontally across page to obtain the best fit with all available readings. The equivalent RU-149 reading in the left column may be used in an isolated Containment dose projection.

RU-37/RU-38 - Power Access Purge Area monitors; GM tubes with a range of 0.1 to 10,000 mRem/Hr.
RU-158B/RU-158C-Accident range area monitors; Ion-chambers with a range of 0.1 to 10,000 Rem/Hr.

1.3 Steam Generator Tube Rupture supporting information

1.3.1 Steam Generator Tube Rupture

1.3.1.1 The release path may be steam released directly via the Main Steam Safety Valves (MSSVs); the Atmospheric Dump Valves (ADVs) or the Steam Bypass Control System valves (SBCS numbered 1007 and 1008).

1.3.1.2 The release path may be through the Plant Vent Stack from the condenser air removal line (and through the Condenser Air Removal filter if lined up).

1.3.1.3 The release will most likely be a combination of the above, with a very complex situation of valves opening varying percentages for varying periods. The initial projections will be very conservative, and the EOF Staff should make it a priority to break down the release into more accurate separate calculations. It is essential that the Operations/Technical Staff assist in this effort.

1.3.1.4 A possibility exists that a Steam Generator could fill completely during an accident (go solid). If a generator would fill with primary side water such that fresh primary is being dumped to the atmosphere all projected Thyroid CDE data should be multiplied by 100.

1.3.2 Early indicators

1.3.2.1 An early indication of a primary/secondary leak at power will be given by the RU-142 monitors, Channels 1 through 4. They will indicate roughly 40 cpm to 300 cpm as conditions change from normal (no leaks) to about 30 GPD. This reading is quantitative only, as where the leak physically occurs in the Steam Generator will have a significant effect on the N-16 carryover activity. Therefore the primary use of these monitors will be in the initial leak phase, prior to reactor shutdown. Increases seen on these channels will be one of the first indications that a leak is occurring, and will serve to verify any RU-4/5/139/140/141 increases seen. In a significant leak (>30 GPD) these monitors can be expected to go way upscale, perhaps even saturate; and the shine from the affected generator line will probably result in indications on all three adjacent detectors.

1.3.3 Other RMS

1.3.3.1 Applicable monitors are RU-141; RU-143/144; RU-139/140; RU-4/5.

1.3.3.2 RU-141 monitors activity from the Condenser Air Removal System (CARS); with the Alert Alarm will indicating an activity increase of 4X > normal; the High Alarm will line up the CARS filter and equates to a 1 GPM Tube Leak assuming 1% Failed Fuel. The CARS line inputs into the Plant Vent Stack, upstream of the RU-143/144 Stack monitors.

1.3.3.3 An RU-143/144 alarm may be a result of more than one input (see map on DPTB Page 11).

1.3.3.4 RU-139 A&B and RU-140 A&B are the main steam line monitors located upstream of all Safety's/Dumps/ADVs. They will over-respond initially to N-16 carryover in the steam if the reactor is still critical during a tube rupture phase. They will have a period when release activity is being carried over by the steam but is not seen as it is less than the 1.5 mRem/hr keep-alive source value.

1.3.4 Worst case defaults

1.3.4.1 Should RU-139/140 be inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release These default values are based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, and assume 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release

1.3.5 DOs and DON'Ts

1.3.5.1 Verify with OPS that the CAR Filter is lined up.

- The default value of 95% should be used for iodine removal efficiency unless the Condenser Air Removal filter is unavailable or indications of impaired efficiency exist. Indications would be alarms from the filter bank temperature and pressure sensors in the Control Room. Temperatures of > 265° F indicate impaired filtration; > 625° F indicates a fire in the carbon filter banks; high differential pressure indicates filter loading. Adjustments to the 95% values should be approved by the RPM/RAC based on the STA/TSC Staff information.

1.3.5.2 Adjusting defaults for over conservatism.

- The default value for RCS Hot Leg (210°) reflects the lowest possible vapor value and is not meant to be a reasonable value to use.
- The default steam flows will most likely never be appropriate to use for a 2 hour release scenario. The maximum steam flows possible (100% power) are in the table below - these should be adjusted per the STA and Tech Staff estimates - DO NOT BE RELUCTANT TO MAKE COMMON SENSE ADJUSTMENTS and then DOCUMENT your thought process.

Component @ 100% Power	Maximum Flow in Lbm/Hr
Output of both Steam Generators	1.72E7
Output of one Steam Generator	8.59E6
Fully Open Safety Valve	9.70E5
Fully Open Steam Bypass Control Valve	9.03E5
Fully Open ADV	1.90E6

- The Steam Generators cannot maintain maximum steam flow for anywhere near two hours after reactor trip. The ADVs/Safety's/Steam Bypass Control valves are typically only partially open for short duration periods.

1.3.5.3 Be aware that releases occur below the RU-139/140 threshold level.

- Only activity greater than the 1.5 mRem/hr threshold level of the RU-139/140 inline monitors will be seen via RMS. If it is likely that activity is being released at these lesser levels, a bounding calculation can be done by using the current Meteorological data and running a projection using 1.5 mRem/hr.

1.4 LOCA Supporting Information

1.4.1 This accident scenario models an RCS leak outside of containment;

1.4.2 The "Plant Vent Exhaust Contributors" and "Fuel Building Exhaust Contributors" should be reviewed to ensure the correct release path(s) are being used.

1.4.2.1 Note that a SIAS will route any activity from the lower level Auxiliary Building Ventilation (below 100') through the Fuel Building Essential Filters. This activity will be released via the Fuel Building Stack and monitored by RU-145/146, with the above 100' levels of the Auxiliary Building being released via the Plant Vent Stack and monitored by RU-143/144.

1.4.3 Fuel Building Vent Stack: leakage activity is released through the Fuel Building Vent Stack and monitored by RU-145/146 or FB PASP.

1.4.3.1 An accident involving elevated Fuel Building activity due to a Spent Fuel bundle leak should be modeled under "Fuel Handling Accident" which utilizes a different source term mix is used.

1.4.4 Plant Vent Stack: Leakage activity is released through the Plant Vent Stack and monitored by RU-143/144 or the PV PASP;

1.4.4.1 An accident involving elevated CARS (Condenser Air Removal System) activity should be modeled under "Steam Generator Tube Rupture 1%" or Steam Generator Tube Rupture 100%" which utilizes a different source term mix.

1.4.4.2 Typical sources from Auxiliary Building Equipment include Letdown System leaks, Sample System leaks, Gas Stripper leaks, etc.

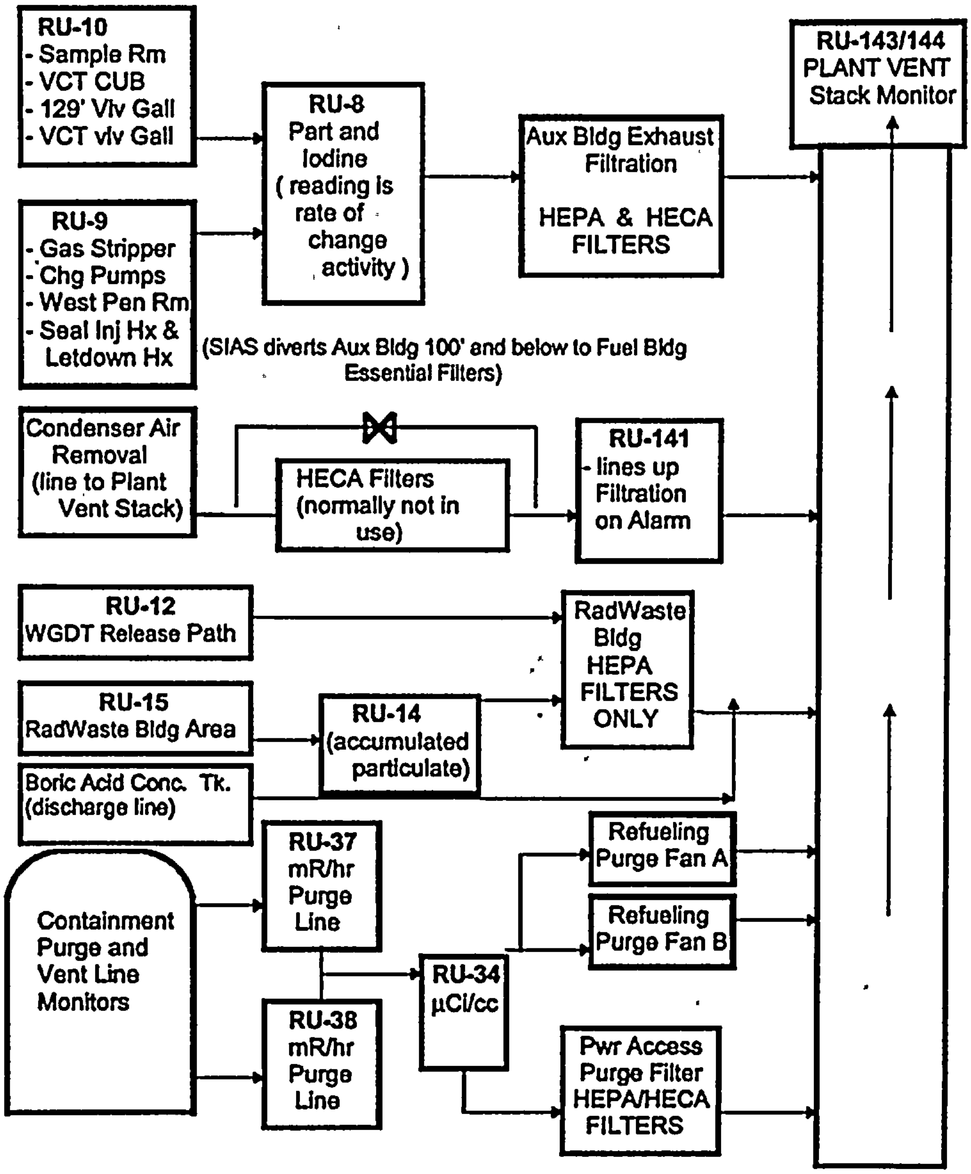
1.4.4.3 The RadWaste Building ventilation exhaust is routed to the Plant Vent Stack. Contributions from the RadWaste Building include the building ventilation, waste gas decay tank discharges and boric acid concentrator discharges. There is no iodine filtration on this release path.

1.4.4.4 An accident involving a Surge Tank or any WGDT which has been isolated for less than 45 days should be modeled as a LOCA 1% to project iodine activity.

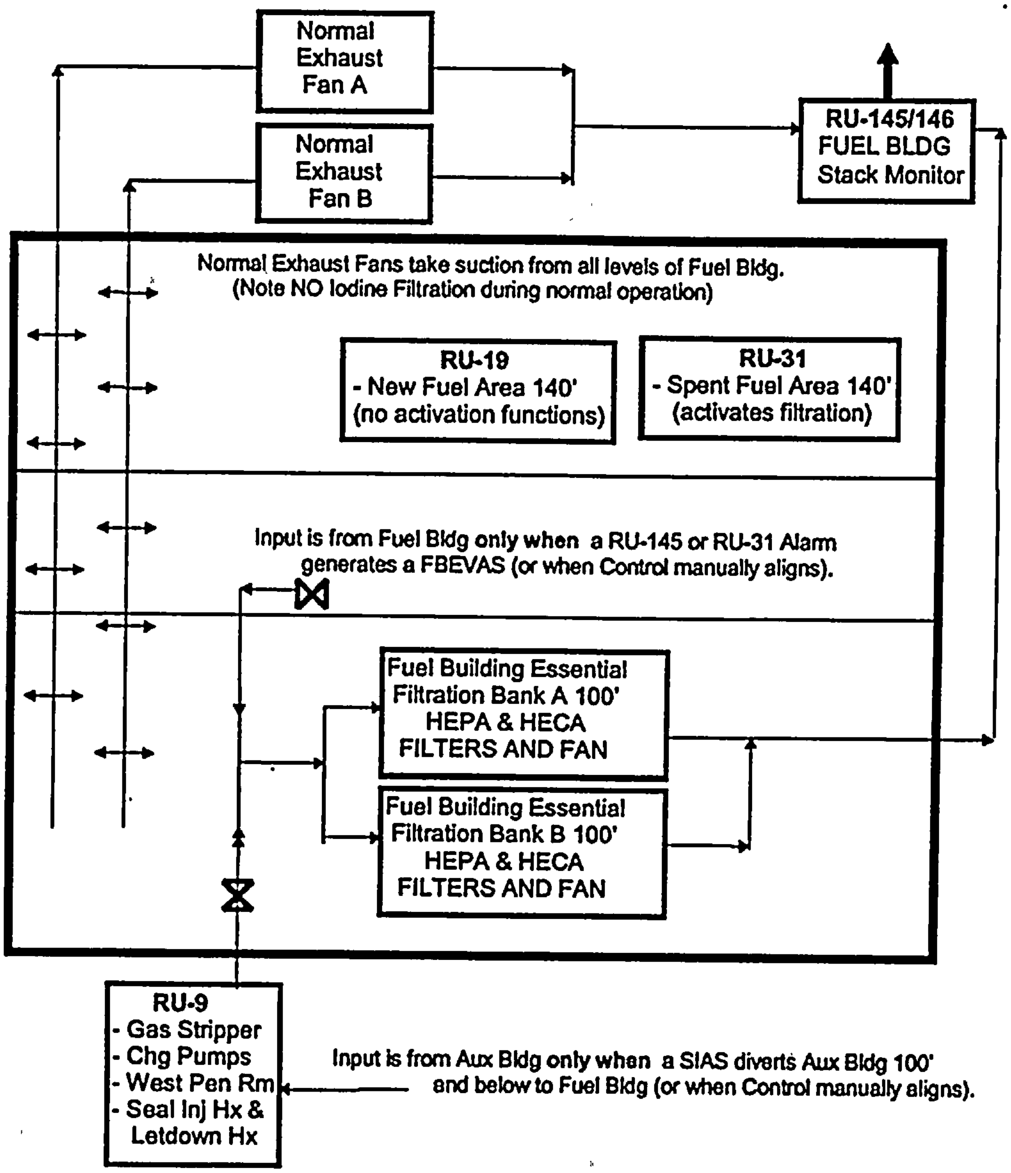
1.4.4.5 A third major source is from the Containment Purge System: a Containment Refueling Purge (non-filtered), a Power Access Purge (filtered) or a Non-Standard Containment Purge (filtered) all release via the Plant Vent Stack.

1.4.4.6 Use of the LOCA 100% accident assumes that an RCS leak has occurred with > 10% cladding failure resulting in significant iodine levels.

1.4.5 Plant Vent Exhaust Contributors



1.4.6 Fuel Building Exhaust Contributors



1.4.7 Basis for Default Ventilation Flow Data

For the Plant Vent	**Stack Flow**	**Default Assumptions**
If fan or pump is running	Maximum rated flow	For Plant Vent:
HAN-J01A (Aux Bldg Normal)	30,000 cfm	
HAN-J01B " " "	30,000 cfm	If Refueling Purge is not operating, 1.13E5 CFM would be the Maximum Default.
	60,000 cfm total	
HRN-J01A (RadWaste Bldg. Normal)	25,500 cfm	1.46E5 CFM with Refueling Purge Operating.
HRN-J01B " " "	25,500 cfm	
	51,000 cfm total	
CPN-J01A (Cnmt.Refueling Purge)	16,500 cfm	
CPN-J01B " " "	16,500 cfm	
CPN-J02 (Cnmt. Power Access Purge)	2,200 cfm	
	35,200 cfm	NOTE:
Condenser Air Removal Pump A	60 cfm	The above defaults include 1540 cfm from the Condenser; while the 2200 cfm from the Cnmt. Power Access Purge is not included.
" " " " B	60 cfm	
" " " " C	60 cfm	
" " " " D	60 cfm	
Gland Steam Exhaust Blower	1300 cfm	
	1540 cfm total	
For Fuel Building Vent	**Stack Flow**	For Fuel Building
If fan is running	Maximum Rated Flow	
HFN-J01A (Normal)	21,750 cfm	43,500 CFM if Normal Fans are operating.
HFN-J01B "	21,750 cfm	
	43,500 cfm total	
HFA-J01 (Essential)	6000 cfm	12,000 CFM if Essential Fans are operating.
HFB-J02 "	6000 cfm	
	12,000 cfm total	

1.5 Fuel Handling Accident Supporting Information

1.5.1 The accident assumption is that a Fuel Handling accident has occurred releasing activity from a fuel bundle. A Fuel Handling accident is considered to be primarily a noble gas cloud and the mix used by Mesorem reflects this. The immediate concern would center primarily onsite.

1.5.2 The mix assumes that virtually all the released activity will be decayed down to primarily Xe-133 and Kr-85, and that all Iodine will be decayed to Iodine 131.

1.5.3 Fuel Building

1.5.3.1 The release is postulated to pass through the Fuel Building Essential Filters enroute to the Fuel Building Vent Stack, where it will be monitored by RU-145/146 or the FB PASP (a FBEVAS or manual operation of Essential Filters is required for iodine filtration; iodine filtration lineups and flowrates should always be verified with Operations).

1.5.4 Containment Building

1.5.4.1 Fuel Handling accident; the release is postulated to pass through the 42" Refueling Purge lines enroute to the Plant Vent Stack, where it will be monitored by RU-143/144 or the PV PASP (the containment may be isolated and/or the purge stopped in short order in such a case; if so, the "Isolated Containment" should then be used to project dose at Site Boundary).

1.5.5 SCRAM TIME

1.5.5.1 For the "Has Reactor Been Scrammed?" prompt:

- The answer to the prompt should always be "Y" as the fuel bundle will no longer be critical ("Y" tells the program to start decaying the mix).

1.5.5.2 For the elapsed time since scram prompt:

- The number of hours and minutes since the fuel bundle has been critical should be entered. An accurate entry of hour and minutes will not be immediately available; a conservative default time to use for decay would be the time the reactor was shutdown for the most recent refueling outage (maximum allowable number of hours is 999.00 - hours greater than 168 will have an insignificant impact on the calculation).

1.6 Waste Gas Decay Tank

1.6.1 The accident assumption is that the Waste Gas Decay Tank has been isolated from the gas header and Surge Tank. The release would be through the RadWaste Building HEPA filters and monitored by the Plant Vent Stack RU-143/144 or PASP monitor. Per the UFSAR analysis of a rapid release using maximum inventory, the iodine dose would be 3 mRem or less at Site Boundary; therefore no iodines are projected. For a Surge Tank or any online tank or pathway gaseous release which may contain significant iodine activity (has been isolated for < 45 days) use the " LOCA 1%" scenario.

1.6.2 SCRAM TIME

1.6.2.1 For the prompt "Enter number of hours and minutes since the tank has been isolated ":

- The Shift RadWaste Building Operator will provide the time since the tank has been isolated (if the time is not readily available use the default of 999 hours).

1.7 Unmonitored release

1.7.1 General notes

1.7.1.1 Typical accident assumptions would be that a release is occurring which is not monitored by an RMS monitor, nor is there a flow rate available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release would be a ruptured tank in the RadWaste Yard which contained radioactive liquids; an outside fire involving radioactive waste, an accident involving a waste shipment on site, an accident in the Radwaste Storage Building, etc. In all those cases, release rates would typically be relatively low, but the potential does exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a Mesorem projection until actual Site Boundary data is available. The below information may be used to supplement the Dose Projection guidance.

1.7.2 Categorize - Fit the release into one of the below three conditions and follow the direction.

1.7.2.1 Primarily Noble Gas- with neither iodines nor particulates being significant contributors (a ruptured liquid outside storage tank, a fuel handling accident or waste gas tank accident being release through an open roll-up door, breach in wall, etc., a system/tank vent in containment during an outage with outside hatch).

- These can be modeled by using a WGDT (you are fairly certain there is no iodine present) or Fuel Handling accident (if there may be small amounts of iodine being released) selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.2 Noble Gases and Iodines - with particulates not being a significant contributor (a.breach in the Aux. Bldg/Fuel Bldg. during LOCA conditions, degassing of a major tank/system volume in containment during an outage with outside hatch open).

- These can be modeled by using a LOCA accident selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.3 Primarily Particulates - with noble gas and iodines not being significant contributors (a fire involving compacted waste, resins, etc.).

- Mesorem will be of limited usefulness in this situation. Follow the direction on the next page to obtain an initial PAR.

1.7.3 Particulate Release - The Mesorem Jr. built-in projections will not model a particulate only release. However, the plume "footprint" as developed by Mesorem from current Met data will be useful, and a projection should first be run for this purpose (using any accident scenario). The Chi/Q values generated in this projection will be used to develop Site Boundary dose estimates, per the following methodology.

1.7.4 Plume footprint - Perform a LOCA 1% Mesorem run using actual meteorological data (all other inputs are unimportant at this point). Obtain the printout.

1.7.5 Release Rate - Determine the best estimate of the number of Curies involved in this release per RadWaste paperwork and/or RadWaste Group. Use this total curie number and estimate how quickly the material is being released.

1.7.5.1 Example: a group of 55 Gal Drums is burning. Reviewing the paperwork with RadWaste indicates a total of 12 Curies are involved. Estimates from Fire Protection at the scene indicate they expect the total fire time to be 60 minutes. Assuming that all 12 Curies will eventually be released, the release rate would be 12 Ci/60 Min or 12 Ci/3600 Seconds or 3.33E-3 Ci/Sec.

1.7.6 Dose Conversion Factor - Per the R/W paperwork select a Dose Conversion Factor (from DCFs below). These represent TEDE dose based on annual waste stream sample analysis.

DCF per Waste Category (Rem-M^3/Ci-hr)	Unit 1	Unit 2	Unit 3
Dry Active Waste (*55 Gal Drums*)	4.08E5	8.26E4	1.08E5
Resin Lo Level	2.76E5	7.35E4	7.91E4
Resin Hi Level	8.05E4	6.02E4	5.62E4
Process Filters	1.76E5	3.29E4	5.02E4
Concentrate	3.75E5	1.07E5	6.90E4
Tri-Nuke Filters	2.10E5	5.98E4	5.68E4
Resin Condensate Demins	5.69E4	5.69E4	5.69E4
Resin Blowdown	1.41E5	6.24E4	6.24E4

1.7.7 Then: __________ Ci/Sec (estimated release rate) X ______________ receptor Sec/M3 = ________ Ci/M3 X ____________ Rem-M3/Ci-hr = _______ Rem/hr in TEDE at the receptor.
where: the Sec/M3 is the Chi/Q at the receptor site (normally Site Boundary but may be used for any receptor point) and taken from the Mesorem printout you directed per current Met. data.

1.7.8 Followup actions

1.7.8.1 Expedite efforts to obtain grab samples and detailed dose rate readings (accurate times samples are taken and specific locations of samples and dose rates will be crucial for later reconstruction of release). For tanks, waste shipments, etc., there may be isotopic analysis of contents available, and these should be obtained for Technical Staff use.

1.7.8.2 Direct actions to isolate event onsite with appropriate radiological postings; have word passed as required for protection of Onsite personnel; provide airborne ingestion and inhalation protection for the responding staff in a conservative manner until field samples are available.

1.7.8.3 Fax isotopic information to ARRA as it becomes available; the RASCAL Dose Assessment Program used by ARRA has some options to input particulates which Mesorem does not.

1.7.8.4 Whole Body Count field teams and other selected available personnel who have been in or near the plume. This information can assist in the recreation of the event (e.g., negative results might show no release occurred).

1.7.8.5 Whole Body Count data can be used to determine the skin dose received by an individual in cases where individuals immersed in a plume may have received high noble gas exposures. Such individuals should be brought in and the dosimetry department directed to perform the appropriate body count and analysis.

1.8 Source Term Monitoring

1.8.1 Need to verify source term

1.8.1.1 "The largest single component of uncertainty is expected in the estimate of the source term"; "Dose projections should be viewed only as rough estimates"; "It is apparent that, overall, the best that can be expected early in an accident release sequence is that projected doses may be within a factor of 10 of the doses based on field monitoring; it is likely that they will be less accurate" - these statements are all from NUREG/CR-5247, RASCAL Version 2.1 User's Guide. Radiological Assessment System for Consequence AnaLysis is the USNRC's Dose Assessment Program, and the cautions apply to us as well as them.

1.8.1.2 Training Drills and Exercises are conducted with data that correlates well. This is a necessity if the training is to be effective, although not realistic. Expect to have to make a correlation adjustment in actual conditions.

1.8.2 Initial actions

1.8.2.1 Direct sampling to allow comparisons of actual samples to the Iodine/Noble gas ratios and mixtures used by Mesorem.

1.8.2.2 Ensure that grab samples are obtained from the onsite release source, whether via the stack monitor sampling rig, or by local samples.

1.8.2.3 Verify filtration is in effect and fuel condition assumptions are correct.

1.8.3 Comparison actions

1.8.3.1 RO2/2A Closed Window readings may be compared to the calculated mRem/hr (external EDE) readings at a specific location.

1.8.3.2 The initial Particulate and Iodine µCi/cc values will be radioed in by the field teams (these readings are converted from cpm/min to a gross µCi/cc value based on I-131 equivalent energy). The Iodine cartridge mCi/cc level may be used as a Rem/hr approximation for comparison with the projected Thyroid CDE value at that same point.

1.8.3.3 A worksheet to accomplish the above comparisons follows on the next page.

1.8.3.4 As soon as possible, a centerline sample should be brought onsite for an isotopic analysis. The total µCi/cc from Noble Gases and Iodines may be used by the RAC Staff to back-calculate the source term or determine the external EDE/TEDE ratio.

1.8.4 Corrective actions

1.8.4.1 If the I/NG ratio and mix in Mesorem are close to the actual composition, adjust the Mesorem projection by repeated runs, varying the RMS value until projected data agrees with the field data.

1.8.4.2 If the I/NG ratio and/or the mix need adjustment, obtain the isotopic analysis of the sample that best fits the current situation. Per Section 4.0, page 18, "Running a Projection Using Grab Sample Data" direction, obtain an updated projection reflecting the actual source term. Note that the RMS value entered may not match the activity calculated per the sample. Mesorem will alert you to that fact by pointing out whether the entered RMS value is high or low, and then asking if you want to continue. Continue to obtain a projection based on that specific mix.

1.8.5 MESOREM receptor comparison worksheet

1.8.5.1 As early as possible, verify that the projection is reasonable by comparing actual field results to projected. This worksheet provides a simple way to convert the projected readings to numbers that can be readily compared to field readings. Results and thought processes are to be entered in the formal log for record keeping purposes.

1.8.5.2 Direct the teams to call in closed window (CW) dose rates (equal to external EDE) and a gross iodine µCi/cc based on the frisker reading taken on a air sample silverzeolite cartridge.

1.8.5.3 Make sure the readings used are CENTERLINE (C/L) and are a reasonable time match (if the sample was taken at Site Boundary, and the plume took ~30 minutes to reach Site boundary, then the Mesorem projection used for comparison purposes should have been done about ~30 minutes ago).

1.8.5.4 Comparison

ACTUAL	PROJECTED
Field Reading @ ______ miles	Projected Reading @ ______ miles
CW ______ mR/hr	External EDE ______ mR/hr
Gross Iodine ______ µCi/cc	Projected Iodine ______ µCi/cc

Where "Projected Iodine" is equal to

______ sec/m3	x ______ µCi/sec	³ 1 E6	= ______ µCi/cc
(DCHI/Q) from Page 1 MESOREM printout; additional distances require setting a DYNAMIC Receptor at that field location for the projection.	(Release Rate) from Page 4 MESOREM printout; use the I, not NG, release rate (same release rate applies to all distances).	Conversion constant (µCi/m3 to µCi/cc)	The Projected Iodine per MESOREM, Jr.

1.9 External EDE/TEDE Ratios

1.9.1 Need for ratios

1.9.1.1 An immediate need as Onsite and Offsite Field Teams are dispatched is to provide the teams with TEDE dose limits (EPA guidance and recommendations on dose limits for workers during emergencies is detailed in Appendix K - Emergency Exposures and KI) and a means to remain within those limits using only SID and dose rate meter readings (external EDE values).

1.9.1.2 In addition, in severe accidents the Thyroid CDE dose needs to be monitored for KI administration (if > 25 Rem).

1.9.2 TEDE Dose

1.9.2.1 As calculated by Mesorem and per EPA guidance TEDE is the external EDE dose summed with the CEDE dose. Determine the TEDE Dose limit to be applied for each Field Team (per a review of section Appendix K - Emergency Exposures and KI).

1.9.3 Lo CEDE Dose

1.9.3.1 In releases which are primarily Noble Gas with minimal Iodine levels (low CEDE value) the ratio of external EDE to TEDE will approach "1" and no correction to the SID reading will be required. Determine desired TEDE Limit for each team and direct them to use un-corrected SID Dose to remain within that limit.

1.9.4 Hi CEDE Dose

1.9.4.1 In releases with significant iodine levels, the CEDE will become larger and the ratio of the SID reading (external EDE) to TEDE will become less than one. Per EPA recommendations in such cases, the TEDE dose limit should be ratioed down to provide effective TEDE dose control via control of External EDE. Determine desired TEDE Limit for each team and determine the working SID Dose to remain within that limit per below direction.

1.9.5 EDE/TEDE calculation

1.9.5.1 An initial external EDE/TEDE ratio using the Mesorem projection data can be done, remembering that it is critical that the data is selected for the distance from the Site that the Field Team will be operating. Use the "MAX" distance value (the .25 mile data from page one on the printout) for Onsite Teams. As soon as actual field data becomes available the ratio should be checked and updated.

$$\text{ratio} = \frac{\text{external EDE}}{\text{TEDE}}\quad \begin{array}{l}\text{(value from page 1 of the Mesorem printout in mR/Hr)}\\ \text{(value from page 1 of the Mesorem printout in mR/Hr)}\end{array}$$

other values available via PAR Receptor information

1.9.6 Working Limit

1.9.6.1 Multiply the desired TEDE limit for that person or Team by the ratio above; issue the reduced working limit in mRem.

1.9.7 Thyroid CDE Dose Control

1.9.7.1 Determine an appropriate expected Thyroid dose for each Field Team using the Mesorem page 1 projection data initially (dose rates assume C/L exposure for 1 hour). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.2 If the potential Thyroid dose approaches 25 Rem, consider ways to reduce dose; if necessary issue KI (Potassium Iodide). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.3 As soon as actual field data becomes available the expected dose should be checked and updated.

1.9.8 Thyroid CDE from field readings

1.9.8.1 Frisker readings converted to µCi/cc Iodine equivalent can be used to generate an estimated Thyroid CDE rate in Rem/hr from a field sample. Or, the Gross Iodine activity from a completed analysis on that sample may also be used for estimates.

1.9.8.2 Methodology - Multiply the air sample charcoal frisker reading or the total iodine activity from the isotopic analysis (in µCi/cc) times the appropriate conversion factor (in Rem-cc/hr-µCi). Note that the 100% factors are less than the 1% factors due to mix differences.
Sample taken at ____ miles from Site @ ____ degrees from "0" degrees North
Sample taken @ _______ Time on ___________ Date

_______________ µCi/cc X __________ $\frac{\text{Rem-cc}}{\text{hr-µCi}}$ = ___________ Thyroid CDE in Rem/hr

1.9.9 Rem-cc/hr-µCi - When Effective Age falls between 2 listed numbers, use the higher age. Select 1% failed fuel unless plant conditions indicate severe (>10%) fuel cladding failure.

Receptor Effective Age (hrs)	1% Failed Fuel	100% Failed Fuel
0-4	6.0 E 5	3.5 E 5
>4-10	7.0 E 5	5.0 E 5
>10-24	9.0 E 5	7.0 E 5
>24	1.1 E 6	1.0 E 6

1.9.10 Application - Note that this methodology can be used Onsite and Inplant as well as for Offsite teams to estimate initial exposure and provide conservative controls. Detailed individual exposure tracking utilizing normal Site procedure should be initiated as soon as practical.

1.10 Mesorem Jr. Specialized Functions

1.10.1 USE OF "COMMAND MENU" OPTIONS

1.10.1.1 F1 - Update Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Update" allows changing the data similar to redoing a projection, and is usually faster. The projection will then have to be run again; see following instructions on Execute Dispersion Model. Note that redoing the entire projection from the "Execute Dispersion Model" selection will accomplish the same result and may be the simpler approach.

Additional options available are:

1. "F1-Meteorology Data File" allows you to enter precipitation (in/hr) if desired; the precipitation rate is available as a 15 minute rate or as an hourly total on the line printer at the Met Tower. Send an I&C Tech out to obtain the in/hr data.

2. "F5-Receptor Data File" allows you to review the entire list of receptors; or to add, update/display or delete existing receptors. This option is useful to match field data more exactly to a projection; and to calculate a PAR for a specific point not on the receptor list.

1.10.1.2 F2 - Execute Dispersion Model: offers two choices, "F1 - Fast Mode A and update from sequential screens" or "F2 - Mode A and execute model from edited files": "F1" is the normal mode. Use "F2" to run a projection after the files have been edited using the above "Update" selection.

1.10.1.3 F3 - Mode Selection [A or B]: Mode A is always used in the Units and to provide PARS in the EOF; Mode B can be used with the assistance of the Eplan Coordinators if desired.

1.10.1.4 F4 - Display Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Display" allows reviewing the data without the risk of inadvertently changing it.

1.10.1.5 F5 - Back-calculate Source Term: selecting this allows two options "Press A to select the external EDE/TEDE ratio" or "Press B to select Back-calculation of source term". See page 25 for specific direction on these options.

1.10.1.6 F6 - Graphic Display: This selection graphically depicts the plume over a map of the 10 mile EPZ. Selecting this option will allow graphing four different overlays: F1 - External EDE Rate (Immersion) F2 - Adult Thyroid CDE Rate (Inhalation), F3 - Iodine Deposition and F4 - CHI/Q Values.

- The legend supplied with the graph provides the data for the three segments the plume is divided into. The inner segment is provided with one value indicating the peak activity; the next two segments have two values indicating the inner and the outer edge values for that segment; and the "blue" values provided indicate the rates outside the plume and up to it.
- An "ETA" value (Estimated Time of Arrival) gives the time it will take for the plume to reach the 10 mile boundary using the projection wind speed and the assumption that the release has just begun.
- Use the "F2 - Plot" choice to obtain a printout; Use the "F1 - Menu" to exit to the menu. As the wind conditions change a series of graphs should be run and kept as ongoing records of areas potentially contaminated. This will aid the recovery phase.

1.10.1.7 F7 - Password Utility: Used by Emergency Planning Group to set password.

1.10.2 USE OF "RECEPTOR DISPLAY MENU" OPTIONS

1.10.2.1 F1 - External EDE Rate (Immersion): gives the external EDE from plume shine (does not include 4 day deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.2 F2 - Adult Thyroid CDE Rate (Inhalation): gives the Thyroid CDE Rate for all receptors within the designated sectors (normally three).

1.10.2.3 F3 - TEDE Rate (Inhalation): gives the TEDE based on inhalation only (no deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.4 F4 - Protective Action Recommendations and Guides: starts with Site Boundary PAR data as listed on page 2 of the Mesorem printout; then provides PAR Data for all receptors (a review of the following complete receptor list to determine receptors of interest should be done prior to using this option as it is time consuming to scroll through the screens and you cannot scroll back).

- Each receptor will be given Shelter and Evacuation TEDE and TODE dose. The TEDE Dose includes the Inhalation and the 4 Day Deposition Dose for both the Shelter and Evacuation PARS. The Evacuation Dose will therefore be conservative. The minimum or "no dose" value provided will be shown as "< .02" and recommendations will be made as appropriate, including KI Administration.

- The Plume Arrival time in hours is given for each receptor. The time given assumes the release

- May be added as necessary per the "Update Data" option (guidance is on page 2 of this Appendix).

1.10.2.5 F5 - Iodine Deposition Rate: Provides the iodine deposition rate in µCi/m3-sec for all receptors within the designated sectors (normally three). This information will be useful to ARRA and dairy farms in high deposition areas are of particular interest.

1.10.2.6 F6 - CHI/Q Values: Provides the CHI/Q (sec/m3) value for all receptors within the designated sectors (normally three).

1.10.2.7 F7 - Receptor Locations: Provides the same information as the following complete receptor list.

1.10.2.8 Q - Leave Receptor Display Menu: READ THIS PROMPT CAREFULLY!! Selecting "Q" from the Receptor Display Menu will provide the prompt "Do you wish to perform another forecast [Y/N]" ONLY ANSWER "Y" when you are ready to delete the current projection data and start a new projection (begin again). IF YOU WANT TO CONTINUE WORKING WITH THE CURRENT PROJECTION DATA, REVIEW RECEPTOR DATA, PRINT GRAPHS, ETC. enter "N".

1.10.3 PARs for all receptor locations

1.10.3.1 Shelter Dose values and Evacuation Dose values for TEDE and TODE are calculated for about 175 receptor locations beyond the Site Boundary. Although Mesorem automatically reports only the Site Boundary PAR and associated Data on the screen or printout, the additional receptor data can easily be obtained.

1.10.3.2 The complete list of receptor locations is included in this section (they may also be reviewed by selecting "Receptor Locations" on the Receptor Display menu).

1.10.3.3 The Shelter Dose and Evacuation Dose TEDE and TODE values, the Plume Arrival Time, along with the Protective Action Recommendations (including stable iodine administration), may be obtained for any of these receptors by selecting "Protective Action Recommendations and Guides" on the Receptor Display menu.

1.10.4 Receptor display

1.10.4.1 The Receptor Display menu is obtained 3 ways:

1. It appears following the output of a single projection, once one answers "No" to the question "Will this be a simultaneous release?"
2. It appears following the output of a simultaneous projection, once one answers "No" to the question "Do you want to consider other release points?"
3. If back at the Command Menu, select "Display Data", then select "Receptor Data File" on the File Menu.

1.10.4.2 Scrolling - Note that Mesorem Jr. will scroll in order through all the receptor sites starting at Sector "A" and that you cannot scroll back! If you miss the ones you need you will have to start over. Review the following list to be aware of when points will be coming up.

1.10.5 Additional receptors

1.10.5.1 Should none of the existing receptor locations serve the need, one of the "dynamic" receptors (having designation "DY01 thru DY24") may be used for the needed location:

- Select "F1 - Update Data" on the Command menu; then
- Select "F5 - Receptor Data File" on the File menu; then
- Select "F2 - Update/Display a Receptor" on the Receptor Utilities menu
- Use one of the "DY" numbers and enter the required data (note that the "angle" called for is a compass heading from PVNGS to the receptor location desired; where Sector "A" centerline is 0°, and Sector "E" centerline is 90°, etc).
- Once this is done, Mesorem Jr. will calculate doses for the new receptor location.

1.10.5.2 Note that the "Dyxx" Receptor Data will always appear at the end of the receptor display list rather than be placed in the appropriate sector with the permanent individual receptors.

1.10.5.3 List of Receptors

RECEPTOR NAME	DIRECTION	ANGLE (deg)	DISTANCE (mi)	COMMENTS
Site Boundary "A"	N	000.0	00.60	SB, 2, 5, 10,15,20,30,40,50 distances
SC02	N	000.0	07.00	Ruth Fischer School
Site Boundary "B"	NNE	022.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "C"	NE	045.0	01.58	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "D"	ENE	067.5	01.37	SB, 2, 5, 10,15,20,30,40,50 distances
FM05	ENE	075.0	09.00	J.A. Woods Farms
DA04	ENE	071.9	11.62	Stotz Dairy Farm
DA05	ENE	071.9	11.61	Crosswinds Dairy
DA14	ENE	070.6	26.48	Advantage Farms
DA15	ENE	070.4	25.82	Eyherabide I
DA28	ENE	069.6	30.74	La Salvia, Jerome
OF03	ENE	066.0	35.00	APS El Mirage Office
DA16	ENE	081.4	21.37	Van Leeuwen, G.
Site Boundary "E"	E	090.0	01.34	SB, 2, 5, 10,15,20,30,40,50,60 distances
70E	E	090.0	70.00	Apache Junction
85E	E	090.0	85.00	E of Apache Junction
RS01	E	086.0	03.00	Adams Residence
OF01	E	097.0	15.00	APS Buckeye Office
OF02	E	084.0	30.00	APS Goodyear Office
FM03	E	088.0	15.00	Cambron Farm
FM04	E	095.0	09.00	Cooley Farms
DA01	E	092.6	11.06	A&H Dairy
DA02	E	087.3	10.72	Butler Living Trust
DA03	E	086.1	11.07	B&K Dairy
DA06	E	100.0	12.84	Kerr, William
DA07	E	087.4	17.31	Dickman Dairy
DA08	E	087.4	17.31	Eyherabide II
DA09	E	092.3	19.86	Kerr, David Dairy
DA10	E	093.4	20.04	Kerr, John W. Jr.
DA11	E	092.4	19.22	Lamcrest Enterprises
DA12	E	093.6	19.25	Tumbleweed Dairy
DA13	E	093.4	20.20	Hillcrest II
DA17	E	084.9	22.66	Desert View Dairy
DA18	E	088.8	23.69	Bolle & Henry Dairy
DA19	E	089.0	23.69	Heartland VI
DA20	E	092.2	20.82	Triple J (J. Kerr)
DA21	E	095.7	20.91	Dykstra Dairy
DA22	E	093.4	21.81	Botma, Randy
DA23	E	095.0	23.14	T&K Investments III
Site Boundary "F"	ESE	112.5	01.28	SB, 2, 5, 10,15,20,30,40,50 distances
SC01	ESE	105.0	11.00	Palo Verde School
RS02	ESE	106.0	04.00	Wedgeworth Residence
FM01	ESE	122.0	05.00	Desert Farms
DA25	ESE	104.1	22.28	Rainbow Valley North
DA26	ESE	104.1	22.28	Rainbow Valley South
DA24	ESE	100.6	21.66	Kuiper, Darrell
DA27	ESE	106.23	23.00	Western Sky Diary
Site Boundary "G"	SE	135.0	01.31	SB, 2, 5, 10,15,20,30,40,50 distances
SC03	SE	144.0	08.00	Arlington School
Site Boundary "H"	SSE	157.5	01.88	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "J"	S	180.0	01.68	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "K"	SSW	202.5	01.14	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "L"	SW	225.0	00.75	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "M"	WSW	247.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "N"	W	270.0	00.62	SB, 2, 5, 10,15,20,30,40,50 distances
SC04	W	281.0	22.00	Harquahala Valley School
Site Boundary "P"	WNW	292.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "Q"	NW	315.0	00.74	SB, 2, 5, 10,15,20,30,40,50 distances
MO2	NW	323.0	09.00	MacArthur's Farm
Site Boundary "R"	NNW	337.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
DY01-DY24	Variable	Variable	Variable	Available Dynamic Receptors

1.10.6 Back-calculating source term - Use of the F5 - Back-calculate Source Term? Selecting this will provide the "A" and "B" options on the Command Menu as follows:

1.10.6.1 OPTION "A" - Used to adjust specific area EDE/TEDE ratios. If Noble Gas and I/NG µCi/cc Iodine field air sample data in gross µCi/cc become available the "Press A to select the external EDE/TEDE ratio" option may be used. This option is of limited early use as Noble Gas Isotopic values are required.

- The prompts will be for (a) the noble gas and iodine levels in gross µCi/cc (an MCA analysis will be required for noble gas although gross iodine activity will be available from field frisker readings); (b) the distance the sample was taken in miles from Site; and (c) the angle the sample was taken in relation to "0" degrees North. Note that samples taken outside the sectors used in the projection will not be accepted.

- The completed calculation provides comparison between the actual and the projected air sample data at that point (in gross µCi/cc) as well as a specific external EDE/TEDE ratio for that sample area. Use the updated ratio for that team and make adjustments to the team dose limits as appropriate. Thyroid CDE will also be provided.

1.10.6.2 OPTION "B" - Use to develop data to update the source term: As the initial Field Team dose rates become available (closed window mRem/hr at a known distance from Site center and the angle between the field dose rate and "0" degrees North) they may be entered into Mesorem via the "Press B to select Back-calculation of source term" option. This option will be of use during the early event phase as field dose rates will be the first information available defining the plume.

- The prompts will be for the field reading in mRem/hr (closed window); then the distance in miles from Site; and the angle the reading was taken in relation to "0" degrees North (Note that readings found outside the sectors used in the projection will not be accepted).

- The completed calculation provides the projected versus actual field reading at the same point for comparison; as well as projected and adjusted release rates. Several field samples should be collected prior to source term adjustment which is then done by repeated Mesorem Jr. runs until a "best fit" of the accumulated data is obtained.

1.10.7 Running a projection using grab sample data

1.10.7.1 Run projection as normal until the "Breakdown Menu" display appears - select: F1 - Grab Sample Analysis Complete: isotopic data from a stack or field sample is available, and the projection will be calculated based on a corrected mix per the grab sample activity.

- The prompt "Do you wish to utilize current isotopic mix?" may appear after you choose one of the following selections. The question is only asked after the initial projection in a series of projections has been run; and allows you to keep the current mix - (Y) - if you want to keep the current mix, or - (N) - if you want to change the current mix.

- Although the isotopic sample data entered will be used in this choice to calculate a projection dose, the program still prompts for an RMS reading. Reason: the monitor reading entry is used by Mesorem to calculate a comparison source term when you elect to change the mix concentrations or the release rates. After the mix concentrations or release rate data is entered and before the printout is done, Mesorem will display a message indicating whether the updated source term will be > or < than the source term the RMS reading would provide. The program will then ask if you want to continue the projection using the entered concentrations. This comparison provides the ability to work up a release per a specified mix that equates to a specific RMS monitor reading, via multiple backfit calculations. Normally you will enter "Y" to continue the projection.

1.10.7.2 Data entry - The program prompts for the entry of the RMS monitor information, process flow rate and filter efficiency. Answer the prompts. The "Isotopic Mix Menu" appears. On the "Isotopic Mix Menu," three choices are offered:

1. F1 enter isotopic grab sample activity by % of total. Enter the % abundance for the five iodine isotopes, followed by the 13 noble gas isotopes; remembering each group must total 100.

2. F2 enter sample activity in µCi/cc concentration by isotope. Enter the µCi/cc concentration for each isotope - the µCi/cc units are not noted, but that is the format to be used.

3. F3 enter sample activity in release rate by isotope. Enter the µCi/sec release rate for each isotope <u>not</u> µCi/cc.

1.10.7.3 Sample decay - For the "Enter the time that the sample was analyzed" prompt, be aware that the DECAY completed analysis will already have been decay corrected back to the sample collection time. Enter the time between reactor scram and sample collection; or "00:00" if reactor was critical at sample collection time.

1.10.7.4 Finish projection - Step through the remaining steps and the new calculation will reflect the updated mix.

1.10.8 Technical Basis Information

1.10.8.1 MESOREM, Jr. developmental references

1. EPA 400-R-92-001, "Manual of Protective Action Guides And Protective Actions for Nuclear Incidents," October 1991
2. EPA 520/1-88-020, "Federal Guidance Report No. 11 Limiting Values of Radionuclide Intake and Air Concentration and dose Conversion Factors for Inhalation, Submersion, and Ingestion," U.S. Environmental Protection Agency, 1988.
3. Reg Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10.CFR Part 50, Appendix I."
4. NUREG/CR-3344 (PNL-4753), "MESOI Version 2.0: An Interactive Mesoscale Lagrangian Puff Dispersion Model with Deposition and Decay," Pacific Northwest Laboratory, 1983.
5. NUREG/CR-2858, "PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations," November 1982.
6. NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", November 1980.
7. MESOREM, Jr. Background Materials, Program Documentation, Source Code, Programmers Manual, Software Validation Report, Site Verification, and Mesocode Book of Changes on file in the Emergency Planning Department.

1.10.8.2 Some basic information

- All releases are at ground level..
- The stability class is determined using a Delta T from the 35' and 200' Met tower readings.
- The FSAR isotopic mix values for 1% and 100% "Failed Fuel" LOCA and 1% and 100% SGTR are used as conservative for dose projections.
- Mesorem Jr. Chi/Q values are from Desert dispersion parameters as referenced in NUREG/CR-2858.

1.10.8.3 Projection type - In Mode "A", a straight line Gaussian plume projection is calculated and decay corrected doses are provided for the Site Boundary; 2, 5 and 10 mile distances.

1.10.8.4 Release rate determination - A Mesorem calculation is based on Site RMS indications. The current uCi/cc concentration per the release stack Noble Gas Monitor is input along with the flow through that release point. These are converted to a Noble Gas release rate; and the Iodine release rate is then calculated using the FSAR I/NG mix ratios. Iodine filtration efficiency is assumed to be 95% but may be entered as less if needed.

1.10.9 Definitions/Miscellaneous

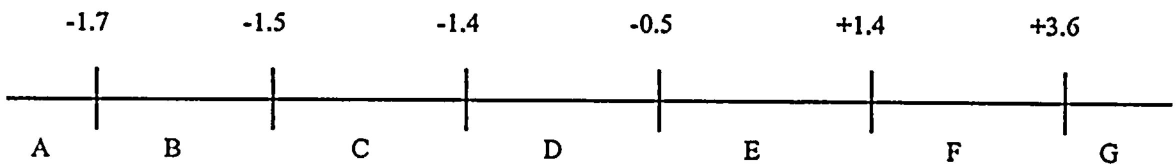
1.10.9.1 Meteorological tower data - The Site Meteorological Tower data needed for dose projection is available on ERFDADS; if the ERFDADS data is unavailable, there are two alternative sources of data prior to falling back on the "default" data entered into Mesorem Jr. The alternative choices should always be used if time permits.

- Choice 2: call the National Weather Service (602-379-4609 or 602-379-4611). They can provide Wind Speed, Wind Direction and Temperature based on information from the tower in the onsite SRP Switchyard area. Use that data to determine an appropriate delta "T" from the table below.
- Choice 1: send an Operator, I&C Tech or RP Tech out to the Met Tower to obtain the data locally: (keys to the tower area are available in Unit 1 and each RFAT).

1.10.9.2 Stability Classification - The delta T is calculated per the below formula in MESOREM Jr.

delta T in °F

If the delta T falls exactly on a number, use the class to the left.



1.10.9.3 The "Default" delta T entered in Mesorem Jr. is a +18 or "G" which is extremely stable but very overconservative in most cases. Therefore, if the Met Tower is unavailable and data can be obtained from the National Weather Service, a better stability class estimation can be used based on wind speed and time of day. Select the appropriate value from the table below and enter as "delta T" for Mesorem projections.

Alternative Delta "T" values for use with NWS Data

Wind Speed (mph)	Day (light)	Night (dim or dark)
<4	-1.6	+4
4-7	-1.4	+2
7-9	-1.4	+1
9-13	-1	-1
>13	-1	-1

References for above table are NUREG/CR-5247 (ORNL-6820) Vol.1, Rev. 2, "RASCAL Version 2.1 User's Guide", December 1994; and Turner, D.B. 1969, "Workbook of Atmospheric Dispersion Estimates". U.S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

1.10.9.4 Topography - Mesorem Jr. calculations include factoring in terrain elevation as the plume travels downwind. As the terrain heights vary smoothly within the 10 mile EPZ this is an un-noticed factor for the most part. At 306° to 309° however an initial rise to the Buckeye Hills begins at around the 8 - 10 mile distance. Because of this rise a plume modeled in that direction will show increased doses at 10 miles as compared to 5 miles, as the plume will be nearer to ground level at that distance. Because of this effect, be aware that dose will not always decrease with distance. Significant receptor sites should be looked at using the Receptor Display Menu or by using one of the Dynamic receptors (section 1.10.1).

1.10.9.5 Emergency Plan meter source check and calibration methodology.

- The Emergency Plan instruments are calibrated every 6 months by Cal Lab; source checked quarterly by the Cal Lab or RP Central; and checked for meter deflection with the button source to use.

- On removal of a meter from a kit for emergency use, the calibration sticker should indicate that calibration has been performed within the last 6 months. The white instrument response check record should indicate the full response check as being done within the last quarter. THE RESPONSE CHECK STICKER WILL NOT BE UPDATED EVERY MONTH AS ON THE UNIT METERS. DO NOT CHANGE THE STICKER as that will remove documentation of the full source check done.

- This methodology is used, as the sources to do the full required response check are not available at all of the Eplan Kits. Meters used in an actual event to determine protective dose rates will be taken to the Cal Lab after the event to have a followup source check done.

- The button source which is available in each kit is used to check for meter deflection on first use of the meter. A log entry indicating that sticker dates have been checked and deflection checks done should be made. A Tech should be assigned to do this initially on facility activation.

1.10.9.6 Definitions

- CDE - The Committed Dose Equivalent. In MESOREM, Jr. it is the dose equivalent to the thyroid that will be received from the inhalation of radioiodine in the plume by an adult during the 50-year period following the intake. In Mode B it includes particulates other than iodine.

- CEDE - The Committed Effective Dose Equivalent. In MESOREM, Jr. it is the sum of risk-weighted CDEs to the various organs or tissues of the body from the inhalation of radioiodine in the plume. In Mode B it includes particulates other than iodine.

- DDE - The Deep Dose Equivalent. This is an NRC term, required for 10CFR20 compliance in substitution for the internationally-accepted external EDE. DDE applies to external whole-body exposure, that is uniform irradiation from an external source, and is the dose equivalent at a tissue depth of 1 centimeter (1,000 mg/cm2).

- EDE - The Effective Dose Equivalent. In MESOREM, Jr., external EDE printouts are for external exposure due to plume immersion. Mode A PAR calculations also include external EDE from iodine deposition. Per NUMARC guidance, the external dose equivalent (which is directly measurable) is an appropriate substitute for external EDE and puts an upper bound on the 10CFR20 quantity "Deep Dose Equivalent" ("DDE").

- SDE - The Shallow Dose Equivalent. For the purposes of this paper it is the dose equivalent to the skin, from external exposure, at a tissue depth of 0.007 centimeters (a density-thickness of 7 milligrams per square centimeter).

- TEDE - The Total Effective Dose Equivalent, the sum of external EDE plus CEDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE in MESOREM Jr. is from immersion only.

- TODE - The Total Organ Dose Equivalent, the sum of external EDE plus thyroid CDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE component in MESOREM, Jr. is from immersion only. By NRC definition, TODE only applies to the organ receiving the highest dose; excluding particulate releases, for PVNGS' credible accidents this organ is the thyroid.

1.10.9.7 Shelter Dose - Shelter Doses are due to external exposure from plume immersion, committed internal dose from plume inhalation, and 96-hours of external exposure from that ground deposition which is projected for the projected plume duration; each of these components of dose increases with increased Release Duration. The 96-hour ground shine contribution is specified in EPA 400.

- The first results summary screens or pages of Mesorem Jr. output give external EDE rate in mRem/hour at Site Boundary and at 2-, 5-, and 10-miles; this is external EDE due to plume immersion only.
- The complete external EDE component (i.e., plume immersion and ground shine) of Shelter Dose TEDE and Shelter Dose TODE is calculated within Mesorem Jr. and is included in the PAR summary output of TEDE and TODE. The Site Boundary PAR output is automatic.
- Shelter Dose TEDE is calculated by multiplying the centerline Shelter Dose TEDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose TODE is calculated by multiplying the sum of the external EDE rate due to immersion and the thyroid CDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose thyroid CDE is calculated by multiplying the thyroid CDE rate for the specified receptor location by the release duration.
- No credit is taken in MESOREM, Jr. for shelter Dose Reduction Factors (DRFs of 1 are used); one may view shelter dose as the dose received by individuals in the plume center with no shelter.

1.10.9.8 Evacuation Dose - Evacuation Doses are due to external exposure from plume immersion and committed internal dose from plume inhalation. Ground deposition is not really involved, but is included in MESOREM, Jr. This is equivalent to the EPA 400 provision for use of "Combined Pathway" Dose Conversion Factors.

- The Plume Exposure Time is the Evacuation Time Estimate (2.9 hours for normal weather, 3.3 hours for adverse weather conditions) minus the Plume Arrival Time to the receptor site. Plume Exposure Time used in Evacuation Dose projections made via MESOREM, Jr. will not exceed the Evacuation Time Estimate (2.9 hours or 3.3 hours).
- The Plume Arrival Time is the sum of Plume Travel Time (upwind distance from receptor to release point, divided by wind speed) plus Time Until Release Begins (set equal to zero if release has begun). That is:
- Plume Exposure Time
- Evacuation Time - Plume Travel Time - Time Until Release Begins
- Both Plume Exposure Time and Evacuation Time begin at the time of the dose projection.
- This equation is not applicable to Shelter Dose projections; in Shelter Dose projections Plume Exposure Time is equal to Release Duration and has a user-specified value.)
- When the Evacuation Dose receptor location is already in the plume, Plume Travel Time will be zero, Time Until Release Begins will also be zero, and projected Plume Exposure Time will equal the Evacuation Time Estimate. Plume Exposure Time can be zero; MESOREM, Jr. will show <0.02 mrem Evacuation Doses for such locations, while still recommending evacuation when appropriate, even when Plume Exposure Time = zero at the Site Boundary.
- Evacuation Doses are determined by Plume Exposure Time:
- The TEDE Evacuation Dose is the 4-day external EDE from deposition plus the product of the TEDE rate multiplied by the Plume Exposure Time.
- The Thyroid CDE Evacuation Dose is simply the thyroid CDE rate multiplied by the Plume Exposure Time.
- The TODE Evacuation Dose is the 4-day external EDE from deposition plus the product of the sum of the thyroid CDE rate and the external EDE rate due to immersion multiplied by the Plume Exposure Time.

Appendix S - Abbreviations

1.0 ABBREVIATIONS

ACAD - Automatic Control Access Device
ADV - Atmospheric Dump Valve
AgX - Silver Zeolite
ALARA - As Low As Reasonably Achievable
AO - Auxiliary Operator
ARRA - Arizona Radiation Regulatory Agency
ASCII - American Standard Code for Information Interchange
CARS - Condenser Air Removal System
CAS - Central Alarm Station
CC - Cubic Centimeter
CDA - Core Damage Assessment
CDE - Committed Dose Equivalent
CET - Core Exit Thermocouple
CFR - Code of Federal Regulations
Ci - Curie
CRS - Control Room Supervisor
CSF - Critical Safety Function
CTMT - Containment
CW - Closed Window
DAC - Derived Air Concentration
DAT - Digital Audio Tape
DCF - Dose Conversion Factor
DDE - Deep Dose Equivalent
EAL - Emergency Action Level
EC - Emergency Coordinator
ECC - Energy Control Center
ECL - Emergency Classification Level
EDE - Effective Dose Equivalent
EDG - Emergency Diesel Generator
EOF - Emergency Operations Facility
EOP - Emergency Operating Procedure
ENS - Emergency Notification System
EPA - Environmental Protection Agency
ERDS - Emergency Response Data System
ERFDADS- Emergency Response Facility Data Acquisition and Display System
ESF - Emergency Safety Features
FBEVAS - Fuel Building Essential Ventilation Actuation Signal
FPB - Fission Product Barrier
FTS - Federal Telecommunications System
GE - General Emergency
GPD - Gallons Per Day
GPM - Gallons Per Minute

H2	-	Hydrogen
HDD	-	Hard Disk Drive
HECA	-	High Efficiency Charcoal Assembly
HEPA	-	High Efficiency Particulate Assembly
HPID	-	Health Physics IDentification
HPSI	-	High Pressure Safety Injection
I	-	Iodine
IC	-	Initiating Condition
KI	-	Potassium Iodide
LAN	-	Local Area Network
Lbm	-	Pounds Mass
LCO	-	Limiting Condition for Operation
LOAF	-	Loss Of All Feed
LOCA	-	Loss Of Coolant Accident
LPSI	-	Low Pressure Safety Injection
µCi	-	MicroCurie
MMI	-	Man-Machine Interface
MPH	-	Miles Per Hour
mRem	-	MilliRem
MS-DOS	-	MicroSoft Disk Operating System
MSSS	-	Main Steam Support Structure
MSSV	-	Main Steam Safety Valve
MST	-	Mountain Standard Time
MW	-	MegaWatt
NAN	-	Notification Alert Network
NG	-	Noble Gas
NPSH	-	Net Positive Suction Head
NRC	-	Nuclear Regulatory Commission
NUE	-	Notification of Unusual Event
NUMARC	-	Nuclear Management and Resource Council, Inc.
NWS	-	National Weather Service
OBE	-	Operating Basis Earthquake
OCS	-	Operations Computer Systems
ODCM	-	Offsite Dose Calculation Manual
OSC	-	Operations Support Center
OW	-	Open Window
PAG	-	Protective Action Guide
PAR	-	Protective Action Recommendation
PASP	-	Preplanned Accident Sampling Program
PBX	-	Private Branch eXchange
P/S	-	Primary to Secondary
PSIA	-	Pounds per Square Inch Absolute
PVNGS	-	Palo Verde Nuclear Generating Station
QSPDS	-	Qualified Safety Parameter Display System
R	-	Rem
RAS	-	Recirculation Actuation Signal
RASCAL	-	Radiological Assesment System for Consequence AnaLysis

RCP - Reactor Coolant Pump
RCS - Reactor Coolant System
RFAT - Radiological Field Assessment Team
RMS - Radiation Monitoring System
RO - Reactor Operator
RP - Radiation Protection
RPM - Radiation Protection Monitor
RPS - Reactor Protection System
RRACS - Radiological Records and Access Control System
RVLMS - Reactor Vessel Level Monitoring System
SAE - Site Area Emergency
SBCS - Steam Bypass Control System
SCF - Standard Cubic Feet
SG - Steam Generator
SGTR - Steam Generator Tube Rupture
SIAS - Safety Injection Actuation Signal
SID - Self-Indicating Dosimeter
SM - Shift Manager
SPDS - Safety Parameter Display System
SRO - Senior Reactor Operator
SSE - Safe Shutdown Earthquake
SSN - Social Security Number
STA - Shift Technical Advisor
STSC - Satellite Technical Support Center
TEDE - Total Effective Dose Equivalent
TLD - ThermoLuminiscent Dosimeter
TODE - Total Organ Dose Equivalent
TSC - Technical Support Center
UFSAR - Updated Final Safety Analysis Report
USNRC - United States Nuclear Regulatory Commission
WGDT - Waste Gas Decay Tank
XFMR - Transformer

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-03	**22**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIP-07		17-027I	RADIOLOGICAL ASSESSMENT COMMUNICATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027J	PLANT STATUS TECHNICIAN	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027K	SECURITY COORDINATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027M	GOVERNMENT LIASON	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Q	EMERGENCY OPERATIONS DIRECTOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027R	DOSE ASSESSMENT HEALTH PHYSICIST	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Y	SHIFT TECHNICAL ADVISOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-08		05-015	SUPV-STDS	H/DAWPS-BLDG	PW	1	
EPIP-08		17-027	DISTRICT-MANAGER	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!

Remarks
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Quantity to be Reproduced	
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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-03	**22**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
EPIPS		00-000	WOLFE,W	X/STA-6050	PW	1	
EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
EPIPS		00-000	SMITH,D	X/STA-7294	PW	1	
EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
EPIPS		00-000	SONTAG, M	X/STA-7997	PW	1	
EPIPS		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	SPENCER,B	Y/MARICOPA CNTY DEPT OF EMERG MGMT 2035 N 52ND ST PHX AZ 85008	PW	1	
EPIPS		00-000	PORTER,J CAPTAIN	Y/MARICOPA CO SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	

Remarks

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-03	**22**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	
EPIPS		05-025		B/UII-CR	PW	1	
EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	

Remarks
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x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-03	**22**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
EPIPS		15-002	CAS	D/SEC-BLDG	PW	1	
EPIPS		15-003	SAS	D/SEC	PW	1	
EPIPS		17-001		C/ANX-DW-EOF-LIB	PW	1	
EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 14	ST

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PROCEDURE INTENT

This procedure provides functional instruction for the activation and operation of the Technical Support Center

rev	description
22	This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16DP-0EP13	Emergency Classification
16DP-0EP14	Satellite Technical Support Center Actions
16DP-0EP15	Technical Support Center Actions
16TD-0EP012	Assembly
16TD-0EP031	Core Damage Assessment
16TD-0EP041	Dose Projection
16TD-0EP051	Emergency Exposures and KI
16TD-0EP054	Emergency Response Data System
16TD-0EP056	ERFDADS Application
16TD-0EP161	Protective Actions
16TD-0EP191	Site Evacuation
Unnumbered	Dose Projection Basis Document
Unnumbered	Emergency Action Levels Basis Document

TABLE OF CONTENTS

1.0 OBJECTIVE

This procedure provides functional instruction for the activation and operation of the Technical Support Center (TSC). It should be referenced anytime the TSC is activated. It should also be referenced by other Emergency Response personnel when responding to that facility during any classified emergency event.

2.0 LIMITATIONS AND PRECAUTIONS

2.1 If the TSC becomes uninhabitable, the Emergency Coordinator should select the Emergency Operations Facility (EOF) or other habitable facility as an alternate, with the assistance of the Radiological Protection Coordinator.

2.2 In the event of a Security Contingency, such as a direct armed attack, the Emergency Coordinator should assign other personnel to perform the response actions which are normally performed by Security.

2.3 If an event could endanger arriving personnel due to safety or security conditions, the Emergency Coordinator should decide where emergency personnel should report and change the onsite Unit Evacuation System messages appropriately.

2.4 The NRC shall be contacted immediately following notification of State/County agencies and within 60 minutes following initial, upgraded, or downgraded emergency declarations. The NRC shall be contacted immediately following notification of State/County agencies for emergency declaration termination.

2.5 The NRC phone must be manned continuously at the NRC's request by a Senior Reactor Operator, Reactor Operator, or a Shift Technical Advisor.

2.6 Assembly is recommended at the Alert classification level unless the Emergency Coordinator is reasonably assured that the condition does not have the potential to further degrade. For a Site Area Emergency or a General Emergency, Accountability is required, and must be completed within 30 minutes following the request for Assembly. Accountability does not have to be performed immediately following the request for Assembly at an Alert or lower classification.

2.7 Although Site Evacuation is optional at the Site Area Emergency classification level, it is required at the General Emergency level.

2.8 A currently licensed Senior Reactor Operator must approve any suspension of safeguards directed by the Emergency Coordinator prior to taking the action.

2.9 NUREG 0654 requires notification of State/Local officials and the NRC within 15 minutes and 1 hour respectively, following declaration of an emergency condition. Regulations do not specify a time limit for classifying an emergency. However, consistent with the NRC position published in Emergency Preparedness Position #2 dated 8/95, it is PVNGS management's expectation that 15 minutes is also an appropriate limit for classification of an event once indications are available to the Control Room operators that an Emergency Action Level (EAL) has been exceeded. Failure to recognize that an EAL has been met or exceeded does not delay commencement of the 15 minute classification time-clock. Classifications shall be made immediately following recognition that an EAL has been met or exceeded. It is not appropriate to wait 15 minutes to make a classification once an EAL has been met or exceeded.

2.10 If a conflict exists in the classification level due to an Emergency Action Level discrepancy, the Emergency Action Level most accurately describing the condition should be applied when classifying the event.

2.11 The following non-delegable duties are assumed by the onsite Emergency Coordinator upon classification of an emergency event:

- subsequent reclassification of emergency events
- determination of the necessity for site evacuation
- authorization for emergency workers to exceed 10 CFR 20 exposure limits

3.0 ONSITE EMERGENCY COORDINATOR (EC) ACTIONS

3.1 Initial Actions

3.1.1 EC Turnover

Relieve the Onshift Emergency Coordinator of Emergency Coordinator functions. Form EP-0240, EC Turnover Summary (see Appendix C) may be used to document the turnover.

3.1.2 Record the time and activate the Technical Support Center when the following required facility personnel have arrived:

1. Electrical Engineer
2. Emergency Maintenance Coordinator
3. Mechanical Engineer
4. Operations Coordinator
5. Radiological Protection Coordinator
6. Security Director
7. Technical Engineering Manager
8. Reactor Analyst

Record the time the TSC was activated: ____________________

3.1.3 When facility emergency response personnel have assumed their duties and responsibilities, notify the other emergency response facilities that the Technical Support Center has been activated.

3.2 Subsequent Actions

3.2.1 Classification

Declare the emergency classification appropriate to the Emergency Action Level as determined by the previous flowcharts. Note the declaration time and the emergency classification that was declared.

Time: ____________ Classification: ______________________________

Time: ____________ Classification: ______________________________

Time: ____________ Classification: ______________________________

Inform the Emergency Operations Director of any event or Protective Action Recommendation changes. Discuss options for site evacuation, onsite sheltering, or early dismissal of personnel as required.

3.2.2 Onsite notifications

Conduct onsite notification using the following guidance:

1. For any classification with Assembly/Accountability, go to Appendix I.
2. For any classification with Site Evacuation, go to Appendix J.
3. For other notification announcements, Form EP-0235, Site-Wide Announcement Worksheet (see Appendix C - Forms) may be used.

3.2.3 TSC status briefings

Conduct Technical Support Center briefings based on plant conditions and other problems.

3.2.4 TSC habitability

If necessary, direct the relocation of TSC personnel to the Emergency Operations Facility or other habitable facility, ensuring that radiological precautions are observed.

3.2.5 Potassium Iodide (KI)

Consult with the Radiological Protection Coordinator regarding the use of Potassium Iodide and authorize administration of Potassium Iodide to personnel.

3.2.6 Fire response

Implement 14DP-0FP32, Emergency Notification and Response, and dispatch the Fire Team and Fire Team Advisor. If required, instruct the Security Director to contact the offsite fire department for assistance.

3.2.7 Medical response

Implement 14DP-0FP32, Emergency Notification and Response, and 14DP-0FP11, Emergency Medical Response. Contact x4444 and advise. If necessary, dispatch an emergency medical team and coordinate any required offsite assistance.

3.2.8 Severe Accident Management

Evaluate use of 79IS-9ZZ05, PVNGS Severe Accident Management Guidelines.

3.2.9 Offsite assistance

Request Emergency Operations Facility staff to call the appropriate offsite assistance organizations.

Instruct the Security Director to arrange for access when assistance arrives.

3.2.10 Site access restrictions

For site access restrictions, instruct the Security Director to limit access to PVNGS and to contact the Local Law Enforcement Agency for assistance, if required.

3.2.11 Inplant status

Determine the scope of emergency repairs, radiological surveys, etc. Authorize team dispatch per EPIP-02.

3.2.12 Accident sampling

For an accident sample, direct the Chemistry Coordinator to initiate the actions to obtain accident sampling and analysis per Appendix L .

3.2.13 Contaminated water management

For the disposition of contaminated water in secondary systems, implement 74DP-9ZZ14, Contaminated Water Management Program.

3.2.14 Alternate source for Spray Pond inventory

Implement Appendix M, Ultimate Heat Sink considerations

3.3 Terminal Actions

3.3.1 Downgrading the event

3.3.1.1 Address the following items prior to downgrading the event:

3.3.1.2 Conditions requiring the current emergency classification level no longer exist.

3.3.1.3 The anticipated plant response is such that there should be no degradation to any fission product barriers or increase in radiation releases.

3.3.1.4 Present plant conditions are such that there is no possibility of an adverse impact on the health and safety of the public and plant personnel due to actions associated with event downgrade.

3.3.1.5 Consultation with government agencies and the Emergency Operations Director, if appropriate, has taken place.

3.3.1.6 Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The emergency situation declared in Unit ___ has now been downgraded to a ___________________." Provide special instructions as necessary. Repeat the message once. This responsibility can be delegated.

3.3.2 Event termination

Address the following items prior to terminating the event:

3.3.2.1 The anticipated plant response is such that there should be no challenge to any fission product barriers or radiation releases in excess of Technical Specifications.

3.3.2.2 Present plant conditions offer no possibility of an adverse impact on the health and safety of the public and plant personnel.

3.3.2.3 Consultation with government agencies and the Emergency Operations Director, if appropriate, has taken place.

3.3.2.4 If Assembly had been initiated, sound the "All Clear" Signal for approximately 30 seconds.

3.3.2.5 Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The emergency situation declared in Unit ___ has now been terminated." Provide special instructions as necessary. As appropriate, repeat sounding the "All Clear" Signal and the message once. This responsibility can be delegated.

3.3.2.6 Consult with the Emergency Operations Director for implementation of recovery operations.

3.3.2.7 Direct the USNRC Liaison, Operations to notify the USNRC of emergency termination.

3.3.2.8 Notify the Unaffected Units' Shift Managers of emergency termination.

3.3.2.9 At termination of the emergency classification, notify the PVNGS Nuclear Regulatory Affairs Department or the respective Unit Duty Engineer and request a written summary be provided to state / county offsite authorities within 8 hours (5 days if terminated from a Notification of Unusual Event).

3.3.2.10 Provide copies of required materials, as requested by the Nuclear Regulatory Affairs Department, for preparation of the report.

3.3.2.11 Transfer copies of all associated paperwork to the Emergency Planning Department. Forward all original paperwork to the Unit Operations Department for sorting, collating, and transfer to Nuclear Information Records Management.

4.0 ADMINISTRATIVE SUPPORT ACTIONS

4.1 Initial Actions

4.1.1 Consult with the Security Director to determine and initiate immediate support functions required to aid activation of the facility.

4.2 Subsequent Actions

4.2.1 Render assistance and support for various duties as assigned.

4.3 Terminal Actions

4.3.1 Submit logs, data, and other documentation to the Security Director after event termination.

5.0 CHEMISTRY COORDINATOR ACTIONS

5.1 Initial Actions

5.1.1 When duties have been assumed and an informational briefing has been received, contact the Onshift Chemistry Technician and the Radiological Monitoring Technician for a briefing on current plant chemistry conditions and Radiation Monitoring System trends.

5.1.2 Consult with the Technical Engineering Manager and the Reactor Analyst and determine the needs for additional Chemistry Support personnel based on current plant chemistry.

NOTE

A 3-hour window is generally required for completion of a sample analysis from the time that a sample has been requested. When preparation time is available (e.g., waiting for primary sample decay), sample carts may be prepared and an initial flush of the Post-Accident Sample System may be performed.

5.1.3 If required, consult with the affected Unit Chemistry Technicians and direct that preparations be initiated for use of the Post-Accident Sample System.

5.2 Subsequent Actions

5.2.1 Evaluate, determine, and interpret analyses results of coolant / air samples and provide the results to the Reactor Analyst and technical staff in the Technical Support Center and Emergency Operations Facility.

5.2.2 Keep the Radiological Protection Coordinator aware of current and forecasted sampling / counting activities. Assign priorities as necessary.

5.2.3 If applicable, evaluate the potential for a hydrogen bubble in the steam generator during a tube rupture event.

5.3 Terminal Actions

5.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

6.0 ELECTRICAL ENGINEERING ACTIONS

6.1 Initial Actions

6.1.1 When duties have been assumed and an informational briefing has been received, contact the Satellite Technical Support Center Shift Technical Advisor(s) and relieve responsibilities for electrical engineering support.

6.1.2 Consult with the Technical Engineering Manager to determine and initiate immediate support functions required to aid engineering analyses.

6.2 Subsequent Actions

6.2.1 Support recommendations for actions associated with probabilistic risk assessment and electrical engineering and determine corporate engineering staff requirements to support the recommendations.

6.3 Terminal Actions

6.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

7.0 EMERGENCY COORDINATOR TECHNICAL ASSISTANT ACTIONS

7.1 Initial Actions

7.1.1 When duties have been assumed and an informational briefing has been received, consult with the Operations Coordinator and determine the status of event(s) in progress and which procedures are currently in use by Control Room personnel.

7.2 Subsequent Actions

7.2.1 Obtain required documents from the facility Technical Reference Library and ascertain the bases for current and impending actions based on procedures currently in use by Control Room personnel.

7.2.2 Keep the Emergency Coordinator advised of current / impending operator actions based on procedural direction and the grounds for those actions.

7.2.3 Maintain the Emergency Coordinator aware of operational impacts and projected consequences of events in progress.

7.2.4 Make periodic announcements as directed by the EC concerning emergency classification and other significant plant changes. Form EP-0235, Site-Wide Announcement Worksheet (see Appendix C) may be used.

7.3 Terminal Actions

7.3.1 Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

8.0 EMERGENCY MAINTENANCE COORDINATOR ACTIONS

8.1 Initial Actions

8.1.1 When duties have been assumed and an informational briefing has been received, establish contact with the Operations Support Center Coordinator via the Maintenance Control Line.

8.1.2 If emergency team dispatch is necessary, direct the Operations Support Center Coordinator to form the required team(s) and to designate communications requirements for the team leader. As necessary, determine the need for additional support personnel.

8.1.3 Obtain required documents from the facility Technical Reference Library, if necessary.

8.2 Subsequent Actions

8.2.1 Work with the Radiological Protection Coordinator and the Operations Coordinator to determine emergency team prioritization and dispatch teams IAW the Emergency Coordinator direction. Follow the "Emergency Team Dispatch Guidelines" in section 8.2.2.

8.2.2 Emergency Team Dispatch Guidelines - coordinate repetitive implementation of the following with the Operations Coordinator and the Radiological Protection Coordinator to process and prepare the information necessary for In-Plant and Protected Area Teams:

1. Monitor personnel resource availability via the Radiological Protection Coordinator in the Technical Support Center and/or the Repairs Coordinator in the Operations Support Center.

2. Prioritize team entries and dedicate resources per the following guidelines and in accordance with the EC's direction:

Primary

- Immediate entry needed for life or equipment saving
- 10 CFR 20 exposure limits may be exceeded
- Appendix K - Emergency Exposures and KI, may be used
- Radiation Protection personnel will accompany the team.

Secondary

- No life or equipment saving actions

- PVNGS Administrative Exposure Hold Points may be exceeded
- Appendix K - Emergency Exposures and KI, may be used
- A pre-entry survey will be completed

Normal

- No life or equipment saving actions
- No dose limits exceeded

8.2.3 Work with the Operations Coordinator and the Radiological Protection Coordinator to develop any specfic briefing information, specific job details, equipment requirements, hold (or abort) points at significant segments for the mission, etc. for each team request.

8.2.4 Work with the Radiological Protection Coordinator to ensure each specific team request with the supporting information is provided to the OSC Staff.

8.2.5 Ensure the OSC Staff is using Form EP-0131, In-plant Team Briefing (see Appendix C - Forms) for each team, and that the OSC notifies the TSC as each team leaves and as each team returns to the OSC.

8.2.6 Work with the Radiological Protection Coordinator to monitor each team dispatch and each team debrief on their return.

8.2.7 Provide periodic update briefings to the Operations Support Center Coordinator regarding event status and availability of support personnel.

8.2.8 Advise the Fire Team Leader and Emergency Coordinator of any potential for toxic, chemical, fire, or medical hazards, if required.

8.2.9 Investigate and resolve annunciator alarms on TSC Panel AJ-SDN-UA-001.

8.2.10 For plant equipment problems, assess operation of the following equipment:

- Mechanical
- Electrical
- Instrumentation / Controls

8.2.11 For EC plant status updates, review the following items with the Emergency Coordinator:

- deployment of Emergency Repair Teams
- all repair operations in progress
- those repairs which are crucial
- estimated times for repairs
- status of water supply inventories
- status of support personnel
- status of tools and spare parts
- known radiological conditions

8.2.12 Consult with the Emergency Coordinator to identify and decontaminate those areas requiring decontamination.

8.3 Terminal Actions

8.3.1 Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

9.0 MECHANICAL ENGINEERING ACTIONS

9.1 Initial Actions

9.1.1 When duties have been assumed and an informational briefing has been received, contact the Satellite Technical Support Center Shift Technical Advisor(s) and relieve responsibilities for mechanical engineering support.

9.2 Subsequent Actions

9.2.1 Consult with the Technical Engineering Manager to determine and initiate immediate support functions required to aid engineering analyses.

9.2.2 Support recommendations for actions associated with probabilistic risk assessment and mechanical engineering and determine corporate engineering staff requirements to support the recommendations.

9.3 Terminal Actions

9.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

10.0 OPERATIONS COORDINATOR ACTIONS

10.1 Initial Actions

10.1.1 When duties have been assumed and an informational briefing has been received, brief the USNRC Liaison Operations in the Technical Support Center.

10.1.2 Establish communications with the Operations Advisor in the Satellite Technical Support Center / Control Room.

10.1.3 Synchronize all clocks in the facility with that of the Affected Unit.

10.2 Subsequent Actions

10.2.1 Consult with the Operations Advisor in the Satellite Technical Support Center and evaluate information regarding technical and operational issues concerning the events in progress.

10.2.2 Keep the Emergency Coordinator Technical Assistant advised of the event(s) in progress, which procedures are currently in use by Control Room personnel, and Control Room actions in progress.

10.2.3 Establish provisions for Auxiliary Operator job assignment / tracking requirements to assist the Radiological Protection Coordinator with necessary dose control measures.

10.2.4 Maintain the Emergency Coordinator aware of current activities.

10.3 Terminal Actions

10.3.1 Collect all documentation and associated logs from the USNRC Liaison Operations at event termination.

10.3.2 Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

11.0 PLANT STATUS TECHNICIAN ACTIONS

11.1 Initial Actions

11.1.1 When duties have been assumed and an informational briefing has been received, establish communications monitoring capability with the Unaffected Shift Technical Advisor in the Satellite Technical Support Center / Control Room and the Plant Status Technician in the Emergency Operations Facility.

11.1.2 Record an initial set of current plant data on the facility plant status boards using the approved color code scheme.

11.2 Subsequent Actions

11.2.1 Maintaining open communications capability previously established, record accurate, current plant data on the facility plant status boards on a continuing basis using the approved color code scheme.

11.3 Terminal Actions

11.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

12.0 PROBABILISTIC RISK ASSESSMENT ACTIONS

12.1 Initial Actions

12.1.1 When duties have been assumed and an informational briefing has been received, collect all known facts and parameter trends concerning the events in progress.

12.2 Subsequent Actions

12.2.1 As necessary, identify contingency plans for the following areas:

- time remaining to uncover or melt the reactor core
- time remaining to reach the "point of no return" for operator recovery
- estimated Containment peak pressure

12.2.2 If appropriate, determine optimum equipment recovery actions required which are compensatory and prudent.

12.3 Terminal Actions

12.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

13.0 RADIATION PROTECTION SUPPORT TECHNICIAN ACTIONS

13.1 Initial Actions

13.1.1 When duties have been assumed and an informational briefing has been received, determine the current deployment of Protected Area Monitoring Teams and their status.

13.1.2 Ensure that the facility radio communications equipment is operable and functioning properly.

13.1.3 Remove the Area Radiation Monitor from the emergency locker and place it into operation in the Technical Support Center.

13.1.4 Place the Technical Support Center Radiation Monitoring System monitor RU-13A into operation in accordance with the posted monitor instructions.

13.2 Subsequent Actions

13.2.1 Establish and maintain radio and/or telephone communications capabilities with the Protected Area Survey Teams.

13.2.2 Establish a contamination control point for the facility as required.

13.2.3 For TSC habitability, perform the following actions:

13.2.3.1 Periodically ensure no upscale trends exist on RU-13A for gaseous, particulate, and Iodine activity.

13.2.3.2 Perform facility air sampling in accordance with 75RP-9RP07, Radiation Surveys. < 10 cubic feet air samples may be taken for ALARA considerations. Form EP-0481, Air Sample Data (see Appendix C) may be used for calculations.

13.2.4 Investigate and resolve annunciator alarms on RU-13A and evaluate the impact on facility filtration.

13.2.5 Assist the Radiological Protection Coordinator with administrative functions.

13.3 Terminal Actions

13.3.1 Shut down the Technical Support Center Radiation Monitoring System monitor RU-13A in accordance with the posted monitor instructions after event termination.

13.3.2 Submit logs, data, and other documentation to the Radiological Protection Coordinator after event termination.

14.0 RADIOLOGICAL PROTECTION COORDINATOR ACTIONS

14.1 Initial Actions

14.1.1 Relieve the Radiation Protection Monitor in the Satellite Technical Support Center of responsibilities for Protected Area and In-Plant Teams and radiological controls. **The relief of the RPM should be done as soon as practical, and may be done well in advance of the formal TSC activation.**

14.1.2 When duties have been assumed and an informational briefing has been received, ensure that the Radiation Protection Support Technician is fully briefed and provide initial facility monitoring direction.

14.1.3 Initiate a repititive sequence with the Emergency Maintenance Coordinator to determine emergency team prioritization and dispatch teams, following the "Emergency team dispatch guidelines" in section 14.2.1.

14.1.4 Contact the OSC Coordinator and the RP in the OSC to ensure the use of the Form EP-0131, In-plant Team Briefing (see Appendix C) for each team. Review notification of the TSC as each Team leaves and as each Team returns to the OSC.

14.1.5 Contact the Operations Coordinator in the TSC and review need to coordinate and control AO movement during the emergency.

14.2 Subsequent Actions

14.2.1 Emergency team dispatch guidelines

Coordinate repetitive implementation of the following with the EC and direct the available OSC Staff to prepare and dispatch In-Plant and Protected Area Teams:

1. Keep the Emergency Coordinator advised on all personnel resource availability.

2. Prioritize team entries and dedicate resources per the following guidelines and IAW the EC direction:

Primary

- Immediate entry needed for life or equipment saving
- 10 CFR 20 exposure limits may be exceeded
- Appendix K, Emergency Exposures and KI may be used.
- Radiation Protection personnel will accompany the team.

Secondary:

- No life or equipment saving actions
- PVNGS Administrative Exposure Hold Points may be exceeded
- Appendix K, Emergency Exposures and KI may be used.
- A pre-entry survey will be completed

Normal:

- No life or equipment saving actions
- No dose limits exceeded

3. Conduct or direct briefings with team members (the EC or Control Room Staff will assist for specific job detail). Establish radiation protection equipment requirements and identify any hold (or abort) points at significant segments for the mission.

4. Use form EP-0131, In-Plant Team Briefing (see Appendix C) to document each team dispatch and each team debrief on their return.

14.2.2 If Protected Area radiological conditions could impact personnel, ensure the following items are addressed:

1. support personnel are briefed
2. Security is informed of current conditions
3. Operations Support Center habitability is maintained
4. survey / repair teams are briefed
5. team stay times have been calculated
6. Auxiliary Operators are briefed, issued dosimetry, and tracked with the assistance of the Operations Coordinator

14.2.3 If knowledge of personnel locations in the Protected Area is required, determine the following:

1. personnel traffic routes / areas
2. entry and exit routes
3. personnel protection requirements

14.2.4 TSC habitability

When TSC habitability is impacted, advise the Emergency Coordinator of the need to relocate TSC functions to the EOF or other habitable facility.

14.2.5 If Assembly is directed, evaluate Protected Area assembly areas for potential radiological impact.

14.2.6 If Site evacuation is indicated, determine the need for site evacuation.

14.2.7 If additional personnel / materials are required, contact Radiation Protection in the unaffected Units.

14.2.8 Ensure that dose rate meters from the emergency kit are transmitted to the calibration facility for calibration and required maintenance.

14.2.9 If implementation of a recovery effort is appropriate, consult with the Emergency Operations Director regarding Radiation Protection support.

14.3 Terminal Actions

14.3.1 Collect all documentation and associated logs from the Radiation Protection Support Technician at event termination.

14.3.2 Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

15.0 REACTOR ANALYST ACTIONS

15.1 Initial Actions

15.1.1 When duties have been assumed and an informational briefing has been received, contact the Unaffected Unit Shift Technical Advisor in the Satellite Technical Support Center for a briefing on the current status of core thermal hydraulics parameters.

15.1.2 Access ERFDADS and assess the status of current core parameters.

15.1.3 Request results of PASS samples from the Chemistry Coordinator, as required.

15.2 Subsequent Actions

15.2.1 Assess, evaluate, and conduct analyses of the integrity of fuel cladding and plant systems.

15.2.2 As necessary, assist the Technical Engineering Manager with operational recommendations using additional technical support personnel.

15.3 Terminal Actions

15.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

16.0 SAFETY ANALYSIS ENGINEER ACTIONS

16.1 Initial Actions

16.1.1 When duties have been assumed and an informational briefing has been received, retrieve a current copy of the USNRC Response Technical Manual.

16.2 Subsequent Actions

16.2.1 As directed, and in coordination with the Radiological Assessment Coordinator and Dose Assessment Health Physicist in the Emergency Operations Facility, determine core reactivity assessments and projected Site Boundary and 10-mile radiation doses, considering the following effects on core cooling:

1. time remaining to uncover or melt the reactor core
2. estimated Core Damage Fraction

16.2.2 As necessary, consult with the USNRC Liaison Health Physics in the Emergency Operations Facility and determine comparisons using USNRC Response Technical Manual calculations.

16.2.3 Provide recommendations to the Technical Engineering Manager regarding methods to minimize or eliminate offsite radiological releases.

16.3 Terminal Actions

16.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

17.0 SECURITY DIRECTOR ACTIONS

17.1 Initial Actions

17.1.1 If necessary, refill any vacated Security supervisory positions.

17.1.2 Activating the autodialer

For off-normal shift hours only, activate the Autodialer as directed by the onshift Emergency Coordinator. See Appendix H for instructions.

17.1.3 When emergency notifications have been completed, inform the Emergency Coordinator of any unaffirmed Emergency Response Organization positions.

17.1.4 Emergency ventilation verification

If not previously performed, verify proper system lineup of the Technical Support Center emergency ventilation within 30 minutes of emergency declaration, in accordance with the following steps.

17.1.4.1 Noteworthy items

This document shall not be used to manipulate any components referenced where verification of status is required. Verification implies confirmation of desired status only. Appropriate personnel should be informed when desired status cannot be verified.

Ventilation for the Technical Support Center (TSC) is continually maintained in the "Filtration Mode" of operation, which is the normal lineup, to ensure that the facility remains habitable prior to and during activation. This mode will maintain the facility under a positive pressure with respect to the outside environment and will filter the incoming makeup air supply in addition to the recirculated return air.

Ventilation for the EOF and TSC is not to be taken out of the "Filtration Mode" except when inspections or maintenance must be performed on the filtration train.

Use of this section assumes that no maintenance is currently being performed on the facility ventilation system. Use of this section assumes that the system is in the proper mode of operation.

Facility habitability envelope integrity for the EOF and TSC is maintained by assuring that the airlock doors are shut and by positive pressure verification.

17.1.4.2 Within 30 minutes of the declaration of an initial emergency classification, ensure that all four Technical Support Center airlock doors (two on upper level and two on lower level) are closed to maintain facility habitability envelope integrity.

17.1.4.3 Proceed to the back hallway in the TSC across from the armory, locate the Magnehelic differential pressure gauges, and verify that "on-scale" differential pressure is indicated on the Magnehelic differential pressure gauges, i.e., greater than zero.

17.1.4.4 Perform either action 1 or 2 as appropriate:

1. If no abnormalities are noted, inform the Emergency Coordinator that the status of emergency ventilation for the Technical Support Center has been verified.
2. If abnormalities are noted, inform the Emergency Coordinator that the status of emergency ventilation for the Technical Support Center could not be verified and that HVAC Maintenance Engineers must be notified of the abnormality.

17.2 Subsequent Actions

17.2.1 Perform supplemental onsite notifications as directed by the Emergency Coordinator.

17.2.1.1 Information - The "area list" in step 17.2.1.3 is a list of those areas which may not receive onsite notifications during an emergency event because they are either too distant to receive onsite announcements or they are not equipped with Unit Evacuation System capabilities. Calling these areas ensures that the entire site is notified during an emergency event.

17.2.1.2 If directed to complete supplemental onsite notifications, transmit the following information to personnel contacted at each of the areas listed below:

1. current emergency classification
2. summary of information from the notification message

17.2.1.3 Area list

LOCATION	PRIMARY	ALTERNATE	TIME NOTIFIED		
			Date	Time	Initials
CAS	[6471]	[6472]			
WRF Control Room	[3007]	[3086]			
WRF Pumphouse	[1667]	-------			
Security Firing Range	[370-3345]	[6471]			
SRP Switchyard	[1684]	[1685]			
Engraving Shop	[1758]	-------			
Carpenter Shop	[1736]	-------			
Meteorological Tower	[1676]	-------			
Neutrino Facility	[7063]	[7506]			
Corporate Security	[81-2222]	[81-3333]			

17.2.2 When duties have been assumed and an informational briefing has been received, determine the need for and contact any additional Security personnel as required.

17.2.3 As necessary, specify job duties for Administrative Support personnel.

17.2.4 Maintaining facility security.

17.2.4.1 Maintain Technical Support Center security.

17.2.4.2 Ensure facility personnel badging requirements are maintained.

17.2.4.3 Ensure that 10 CFR 26.20(e) FFD requirements have been maintained. Form EP-0013, Duty Contact Register (see Appendix C - Forms) may be used for guidance.

17.2.5 If Assembly / Site Evacuation is called, see Appendix I / J for instructions.

17.2.6 For vehicle control, consider the following:

17.2.6.1 Coordinate with Radiation Protection to establish air and surface routes for arriving or departing traffic under radiological conditions.

17.2.6.2 Obtain arriving vehicle / personnel information and transmit to Security personnel.

17.2.6.3 Dispatch Security personnel to verify the number of responders and direct or escort personnel to response locations.

17.2.7 Coordinate with the Radiological Protection Coordinator for areas that Security personnel should avoid under radiological conditions.

17.2.8 Offsite assistance

17.2.8.1 As directed, restrict access to PVNGS using Local Law Enforcement Agency assistance.

17.2.8.2 Request offsite emergency assistance as directed and advise the Emergency Coordinator on status.

17.2.8.3 Authorize Protected Area access.

17.2.8.4 Control access to vital areas when the Security Computer is unavailable or as requested.

17.2.8.5 Refer all media inquiries to the Joint Emergency News Center.

17.2.8.6 Ensure Senior Reactor Operator approval is obtained prior to suspension of any safeguards. Examples include search and identification of personnel, search of packages and vehicles, and use of ACADs within the Protected Area.

17.3 Terminal Actions

17.3.1 Collect all documentation and associated logs from Administrative Support personnel after event termination.

17.3.2 Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

18.0 SHIFT TECHNICAL ADVISOR ACTIONS

18.1 Initial Actions

18.1.1 When duties have been assumed and an informational briefing has been received, access ERFDADS and assess the status of plant systems and critical plant parameters.

18.1.2 Contact technical support personnel, the NSSS vendor, and architect-engineer, as directed, regarding technical status or proposed recommendations.

18.2 Subsequent Actions

18.2.1 Maintain a continual assessment of plant systems and critical plant parameters.

18.2.2 Advise the Plant Status Technician of any significant changes to plant status and the Technical Engineering Manager of proposed recommendations and any significant changes to plant status.

18.2.3 Consult with the Technical Engineering Manager regarding implementation of the Severe Accident Management Guidelines when conditions warrant.

18.3 Terminal Actions

18.3.1 Submit logs, data, and other documentation to the Technical Engineering Manager after event termination.

19.0 TECHNICAL ENGINEERING MANAGER ACTIONS

19.1 Initial Actions

19.1.1 When duties have been assumed and an informational briefing has been received, provide a status briefing to the following personnel:

- Chemistry Coordinator
- Electrical Engineer
- Mechanical Engineer
- Plant Status Technician
- Probabilistic Risk Assessment
- Reactor Analyst
- Safety Analysis Engineer
- Shift Technical Advisor

19.1.2 Organize a list of known equipment out-of-service and maintain current.

19.1.3 Determine the need for and contact any additional engineering and technical support personnel as required.

19.2 Subsequent Actions

19.2.1 As necessary, advise the Engineering staff of plant status and resources.

19.2.2 Consult with the Emergency Coordinator regarding current plant status and recommendations for additional resources required for plant stabilization and recovery.

19.2.3 Consult with the Emergency Coordinator regarding implementation of the Severe Accident Management Guidelines when conditions warrant.

19.2.4 Develop a prioritized corrective action plan with the Emergency Maintenance Coordinator regarding the evaluation and restoration of plant systems and available Spray Pond water inventory, including the need for well drilling (ultimate heat sink inventory), if required.

19.2.5 Consult with the Technical Analysis Manager in the Emergency Operations Facility regarding time remaining to uncover the core, if appropriate, and provide the information to the Emergency Coordinator.

19.2.6 Assist the Emergency Coordinator, as required, in areas regarding emergency classification, the assessment, analyses, and evaluation of plant systems integrity, and the need for offsite technical support.

19.2.7 Keep the USNRC representative advised of current contingencies.

19.3 Terminal Actions

19.3.1 Collect all documentation and associated logs from the following support personnel:

- Chemistry Coordinator
- Electrical Engineer
- Mechanical Engineer
- Plant Status Technician
- Probabilistic Risk Assessment
- Reactor Analyst
- Safety Analysis Engineer
- Shift Technical Advisor

19.3.2 Submit logs, data, and other documentation to the Emergency Coordinator after event termination.

20.0 USNRC LIAISON OPERATIONS ACTIONS

20.1 Initial Actions

20.1.1 When duties have been assumed and an informational briefing has been received, contact the STA / RO / SRO in the Control Room for a briefing on the current USNRC communications status.

20.1.2 Using the FTS-2000 (ENS) telephone, assume continuous communications with the USNRC.

20.2 Subsequent Actions

20.2.1 Maintain continuous communications with the USNRC until relieved by a representative of the USNRC Emergency Response Team.

20.2.2 If the emergency classification changes, notify the USNRC within 60 minutes of the change or immediately following offsite agency notification upon event termination and provide details regarding the emergency classification change or termination.

20.2.3 If fax transmissions of information to the USNRC become necessary, receive prior Emergency Coordinator concurrence.

20.3 Terminal Actions

20.3.1 Submit logs, data, and other documentation to the Operations Coordinator after event termination..

Appendix A - Emergency Action Levels

1.0 Precautions and limitations

1.1 The Emergency Action Levels in this section each incorporate an Emergency Action Level Identification Code (i.e., nn-nn) immediately following the Emergency Action Level statement. This code functions as a cross-reference to the PVNGS Emergency Action Level Technical Bases in Appendix Q - EAL Technical Bases. The first number corresponds to the EAL table number in this section. The second number corresponds to the sequential EAL within that table. The identification code number is also employed as data on PVNGS Emergency Message Forms.

1.2 Each entry in this section incorporates the industry generic Initiating Condition (IC) and the plant specific Emergency Action Level. The Initiating Condition should be reviewed to ensure the significance addressed by the Emergency Action Level is taken into consideration.

1.3 The plant operating Mode that existed at the time the event occurred, prior to any protective system or operator action initiated in response to the condition, is the applicable Mode of the Emergency Action Levels. If an event occurs, and a lower or higher plant operating Mode is reached before the emergency classification can be made, the declaration shall be based on the Mode that existed at the time the event occurred.

1.4 If a conflict exists in the classification level due to an Emergency Action Level discrepancy, the Emergency Action Level most accurately describing the condition should be applied when classifying the event.

1.5 If an indication of barrier challenge or failure exists which is inconsistent with the current emergency classification, rediagnose plant conditions and implement the emergency classification indicated.

1.6 If a more severe Fission Product Barrier "LOSS" Category in Section 3 has been met, then assume the "POTENTIAL LOSS" criteria of the associated category has been automatically satisfied.

1.7 Used in the context of a steam generator tube rupture as stated in the Fission Product Barrier Emergency Action Level [1-7], a "prolonged release of contaminated secondary coolant" encompasses a main steam line break, feedwater line break, stuck open steam generator safety and/or atmospheric dump valve(s), and plant cooldown (i.e., to Mode 5) while steaming the affected steam generator to atmosphere.

2.0 Instructions

2.1 Evaluate the following tables and determine the most accurate Emergency Action Level which is currently being met or exceeded.

Table 1: Fission Product Barrier Reference (Modes 1-4)

FUEL CLAD BARRIER		RCS BARRIER		CONTAINMENT BARRIER	
POTENTIAL LOSS	LOSS	POTENTIAL LOSS	LOSS	POTENTIAL LOSS	LOSS
Highest valid CET temperature > 700°F [1-1] RVLMS level < 21% plenum [1-2]	Highest valid CET temperature > 1200°F [1-1] RCS activity > 300 µCi/gm Dose Equivalent I-131 [1-3] CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr, or RU-149 > 1.8E+06 mrem/hr [1-4]	RCS leak > 44 gpm [1-6] SGTR > 44 gpm [1-7] LOAF such that minimum acceptable feedwater flow cannot be maintained [1-8]	RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling, i.e., RCS at saturation conditions [1-6] SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1) [1-7]	CTMT pressure 50 psig and increasing [1-10] CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating [1-10] CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr, or RU-149 > 8.7E+09 mrem/hr [1-11] H2 concentration > 3.5% by volume [1-10] CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored within 15 min. [1-12]	Rapid unexplained CTMT pressure decrease following initial increase [1-10] CTMT pressure or sump level response not consistent with LOCA conditions [1-10] Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists [1-13] Release of contam. Secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage [1-14]
Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier [1-5]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier [1-9]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier [1-15]	

APPLY THE CRITERIA ABOVE TO THE CONDITIONS BELOW	
UNUSUAL EVENT (NUE)	Any loss OR any potential loss of Containment
ALERT	Any loss OR any potential loss of either Fuel Clad or RCS
SITE AREA EMERGENCY (SAE)	Loss of both Fuel Clad and RCS OR potential loss of both Fuel Clad and RCS OR potential loss of either Fuel Clad or RCS AND loss of any additional barrier
GENERAL EMERGENCY (GE)	Loss of any two barriers AND potential loss of a third barrier

Table 2: Electrical Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Loss of All Offsite Power to Essential Buses for > 15 Minutes Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses [2-1]	**IC - AC Power Capability to Essential Buses Reduced to a Single Power Source for > 15 Minutes Such That Any Additional Single Failure Would Result in Station Blackout** Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition: Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG) **OR** Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR) [2-3]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4 [2-5]	**IC - Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4 **AND** Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated [2-7]
IC - Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for > 15 Minutes Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled [2-2]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses During Cold Shutdown or Refueling Mode** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled [2-4]	**IC - Loss of All Vital DC Power** Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4 [2-6]	

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Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer * Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer OR Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-1]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** * Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-8]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** * Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-14]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** * Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-17]
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer * Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer OR Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-2]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** * Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-9]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** * Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-15]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** * Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer OR Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary OR Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-18]

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Unplanned radioactivity release which results in Site Boundary dose rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-3]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Unplanned radioactivity release which results in Site Boundary dose rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-10]		
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Site Boundary dose rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-4]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Site Boundary dose rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-11]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** Site Boundary dose rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary [3-16]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** Site Boundary dose rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary [3-19]

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit [3-5] (normal levels comprise the highest reading in the past 24 hours excluding the current peak value)	**IC - Release of Radioactive Material or Increases in Radiation Levels within the Facility that Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are: (1) > 15 mR/hr: RU-18 Control Room **OR** (2) > 5000 mR/hr: RU-155 Main Steam Support Structure RU-153c Auxiliary Bldg. 100' East RU-23 Chemistry Hot Laboratory RU-19 Fuel Building [3-12]		
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water [3-6]	**IC - Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel** Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal, i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication, such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur **AND** Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145 [3-13]		
IC - Fuel Clad Degradation RCS specific activity > Technical Specification allowable limits [3-7]			

Table 4: Leakage Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - RCS Leakage Unidentified or pressure boundary leakage> 10 gpm in Modes 1-4 [4-1]			
IC - RCS Leakage Identified leakage > 25 gpm in Modes 1-4 [4-1]			

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room for > 15 Minutes Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available [5-1]	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate a Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2 [5-4] (manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS Bus from the Control Room)	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2 [5-7]	**IC - Failure of Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is an Indication of an Extreme Challenge to the Ability to Cool the Core** Failure of RPS to complete an automatic reactor shutdown, i.e., subcritical, and manual shutdown was not successful when in Modes 1-2 AND CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained [5-11]
IC - Inability to Reach Required Shutdown Within Technical Specification Limits Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4 [5-2]	**IC - Inability to Maintain Plant in Cold Shutdown** Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6 [5-5]	**IC - Loss of Water Level in the Reactor Vessel that Has or Will Uncover Fuel in the Reactor Vessel** Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 40AO-9ZZ02, Excessive RCS Leakrate and Safety Analysis Operational Data) [5-8]	

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio [5-3]	**IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room with Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable** Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress [5-6]	**IC - Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown** Loss of any function, i.e., heat removal, reactivity control, or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4 [5-9]	
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system [5-3]		**IC - Inability to Monitor a Significant Transient in Progress** Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available [5-10]	

P216-08N (6-84)

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification [6-1]	**IC - Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown** Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-9]	**IC - Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established** Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes [6-18]	
IC - Natural and Destructive Phenomena Affecting the Protected Area Explosion affecting the Protected Area resulting in visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-2]	**IC - Control Room Evacuation Has Been Initiated** Entry into 40AO-9ZZ18, Shutdown Outside the Control Room, or 40AO-9ZZ19, Control Room Fire, for Control Room evacuation [6-10]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area [6-3]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Vehicle/aircraft crash or missile impact affecting plant vital areas [6-11]		
IC - Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant [6-4]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Visible structural damage to any building containing safe shutdown equipment [6-12]		

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals [6-5]	**IC - Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses [6-13]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Valid "Strong Motion Accelerometer SystemTrigger" indicated on Seismic Warning Panel per 79IS-9SM01 [6-6]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment [6-14]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Tornado affecting the Protected Area [6-7]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity [6-15]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Flooding affecting the Protected Area [6-8]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58 [6-16]		
	IC - Natural and Destructive Phenomena Affecting the Plant Vital Area Flooding potentially affecting safety systems required for the current operating Mode [6-17]		

Table 7: Security Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant [7-1]	**IC - Security Event in a Plant Protected Area** Security event within the Protected Area (RE: 40DP-0OP07) [7-2]	**IC - Security Event in a Plant Vital Area** Security event within any vital area (RE: 40DP-0OP07) [7-3]	**IC - Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown** Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel [7-4]

Table 8: Miscellaneous Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Control Room assessment that an event has occurred affecting the Protected Area [8-1]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Control Room assessment that an event has occurred affecting the plant vital areas [8-3]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate actual or likely major failure of plant functions needed for protection of the public [8-5]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a General Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate: (1) actual or imminent substantial core degradation with potential for loss of CTMT, or (2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary [8-6]
IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event Other conditions exist which, in the judgment of the SM/EC, indicate a potential degradation of the level of safety of the plant [8-2]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert** Other conditions exist which, in the judgment of the SM/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted [8-4]		

Appendix B - Protective Action Recommendations

1.0 Precautions and limitations

1.1 In the event of a declaration of General Emergency, the response by the State of Arizona may involve actions to evacuate the public to include citizens out to ten miles in the Emergency Planning Zone. Note that the state's Protective Action Decision may differ from the site's Protective Action Recommendation.

1.2 The protective actions determined within this document are provided to offsite agencies as recommendations. Offsite agencies may employ conservative adjustments prior to issuing Protective Action Decisions. For this reason, it is essential that protective actions recommended to offsite agencies by PVNGS are accurate.

1.3 Environmental Protection Agency guidance stresses evacuation in lieu of shelter whenever possible. Shelter is appropriate only when evacuation cannot be implemented or when the duration of the release is expected to be shorter than the time period required to evacuate.

1.4 A Protective Action Recommendation may be based on the current emergency classification, current plant conditions, or on a dose projection. When a dose projection is unavailable or not applicable, the Protective Action Recommendation should be based on the current emergency classification or plant conditions.

1.5 The Emergency Operations Director shall be informed of the basis for all recommended protective actions submitted for issuance to the State of Arizona. The information should include any default or abnormal data used to determine the recommended protective action and a clarification of the effect these values may have on the recommended protective action.

1.6 If wind direction is unavailable from installed instrumentation and cannot be clearly determined by alternate means, e.g., the Unit 1 STA link to the RG system, the Protective Action Recommendation must be applied to all sectors. If ERFDADS is unavailable, meteorological information required by the Radiological Monitoring Technician can be obtained by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS. For this case, Delta-T will be derived by the Radiological Monitoring Technician. The Radiation Protection Monitor should ensure that the Emergency Coordinator is informed and that someone is sent to the Meteorological Tower for resolution of failure and to obtain local data, if possible.

2.0 PAR determination

2.1 Application of emergency classification

2.1.1 If any radiological thresholds in Section step 2.0 of Appendix A - Emergency Action Levels, exceed those which are appropriate for the current emergency classification, immediately inform the Emergency Coordinator that radiological conditions exist which warrant an escalation in the current emergency classification.

2.1.2 Using the PAR Table, ensure that the current Protective Action Recommendation meets the minimum required for the current emergency classification.

2.2 Application of plant conditions

2.2.1 Based on bounding projections for plant conditions, review possible radiological release paths / source terms with technical staff members.

2.2.2 If Radiological Field Assessment Team data is available, compare Site Boundary dose rates and sample results with the projections previously reviewed and select the most accurate Protective Action Recommendation appropriate to current plant conditions.

2.2.3 Compare the Protective Action Recommendation selected in the previous step with that selected as the minimum required for the current emergency classification and select the most conservative Protective Action Recommendation.

2.3 Application of dose projection

2.3.1 If dose projection results are available, compare the recommended protective action based on the most recent dose projection to that selected as the most conservative in the previous step and select the most appropriate Protective Action Recommendation.

2.3.2 Inform the Emergency Coordinator / Emergency Operations Director of the Protective Action Recommendation selected and the basis (i.e., defaults or abnormal data used and its effects) for the selected Protective Action Recommendation.

2.3.3 As time permits, complete Form EP-0381, Dose Projected PAR, and provide it to the Emergency Coordinator / Emergency Operations Director.

3.0 Protective Action Recommendations

3.1 Determine the appropriate protective actions using the table below and the RP Monitor's recommendations.

Protective Action Recommendations

CONDITION	RECOMMENDED ACTION
NOTIFICATION OF UNUSUAL EVENT or ALERT declared	NONE
SITE AREA EMERGENCY declared	SHELTER within a 2-mile radius
GENERAL EMERGENCY declared OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): 5 REM > TEDE ≥ 1 Rem 25 REM > TODE ≥ 5 Rem	EVACUATION for 2-mile radius and 5 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)
Large fission product inventory (> fuel clad gap activity) has been released to containment OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): TEDE ≥ 5 Rem TODE ≥ 25 Rem OR Imminent containment failure is projected such that a "puff" release > design leak rate will occur in conjunction with substantial core damage or large fission product inventory	EVACUATION for 5-mile radius and 10 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)

Wind from	Affected Sectors	Distance to S.B.	Wind from	Affected Sectors	Distance to S.B.
169-191	R-A-B	0.82 (A)	349-011	H-J-K	1.68 (J)
192-213	A-B-C	0.83 (B)	012-033	J-K-L	1.14 (K)
214-236	B-C-D	1.58 (C)	034-056	K-L-M	0.75 (L)
237-258	C-D-E	1.37 (D)	057-078	L-M-N	0.63 (M)
259-281	D-E-F	1.34 (E)	079-101	L-M-N-P-Q	0.62 (N)
282-303	E-F-G	1.28 (F)	102-123	M-N-P-Q-R	0.63 (P)
304-326	F-G-H	1.31 (G)	124-146	N-P-Q-R-A	0.74 (Q)
327-348	G-H-J	1.88 (H)	147-168	Q-R-A	0.83 (R)

Appendix C - Forms

TABLE OF CONTENTS

1.0 Precautions and limitations

1.1 Forms in this appendix are to be considered "samples." In accordance with 01DP-0AP01, Procedure Process," the user may copy a sample form from the procedure if the copy is legible enough to use.

1.2 Forms in this appendix are available on the PVNGS Local Area Network (LAN), on drive V:, in directory \Eplan\Forms.

2.0 Forms

2.1 Form EP-0010, Logistics Overview (sample)

FORM EP-0010A **PVNGS EMERGENCY PLANNING**

LOGISTICS OVERVIEW

Name: ____________________ **Time:** ____________ **Date:** ____________

A. ERO Shift Schedule *(describe any abnormalities)*:

____

____

____

____

B. Status of onsite emergency response facilities and equipment:

STSC: ______________________________________

TSC: ______________________________________

OSC: ______________________________________

EOF: ______________________________________

C. Additional manpower / equipment / documentation support needed *(status, problems, etc.)*:

____

____

____

____

D. American Nuclear Insurers *(ANI)* informed of current status *(if applicable, state comments)*:

____

E. Additional information *(if applicable)*:

____

____

____

____

2.2 Form EP-0011, Personnel Shift Staffing, page 1 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

PERSONNEL SHIFT STAFFING (Part 1 of 5)

Complete the checklist below and the attached emergency response facility staffing sheets as necessary to ensure effective transition between shifts. Brief the EOD on staffing requirements, if applicable.

Complete the following items as soon as possible:

____ Staffing established for 2 shifts - EOD briefed as applicable

____ Individual staff members informed of shift assignment and time of shift work hours

____ Emergency response facility staffing boards updated to reflect shift schedules

Complete the following items at shift change:

____ Formal turnover for each position regarding emergency status and duties and responsibilities

____ Staff members briefed on any abnormalities or problems encountered or anticipated

____ Ensure facility managers brief off-going staff on the following items applicable to their facility:

- ____ significant events leading to current plant status
- ____ current emergency classification level
- ____ current Protective Action Recommendation and decisions by the State of AZ
- ____ radiological status
- ____ corrective actions taken thus far
- ____ prognosis on plant status and current state of the emergency

____ On-coming staff assumes duties and responsibilities for their respective positions

____ Shift change occurs

____ Facility managers advised on status of shift change

____ Emergency response facility staffing boards updated to reflect current staff members on shift

2.3 Form EP-0011, Personnel Shift Staffing, page 2 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

SATELLITE TECHNICAL SUPPORT CENTER *(Part 2 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Advisor			
Radiation Protection Monitor ◆			
Shift Technical Advisor ◆			
STSC Communicator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.4 Form EP-0011, Personnel Shift Staffing, page 3 of 5 (sample)

FORM EP-0011 D **PVNGS EMERGENCY PLANNING**

TECHNICAL SUPPORT CENTER *(Part 3 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Onsite Emergency Coordinator ◆			
Administrative Support (two)			
Chemistry Coordinator			
Electrical Engineering ◆			
Emergency Coordinator Technical Asst.			
Emergency Maintenance Coordinator ◆			
Mechanical Engineering ◆			
Operations Coordinator ◆			
Probabilistic Risk Assessment			
Radiation Protection Support Technician			
Radiological Protection Coordinator ◆			
Reactor Analyst ◆			
Safety Analysis Engineer			
Security Director ◆			
Shift Technical Advisor			
Technical Engineering Manager ◆			
USNRC Liaison Operations			
OTHER:			
Facility Advisor			
Plant Status Technician			
Shift Technical Advisor *(additional)*			

◆ - position required for facility activation

2.5 Form EP-0011, Personnel Shift Staffing, page 4 of 5 (sample)

FORM EP-0011c **PVNGS EMERGENCY PLANNING**

OPERATIONS SUPPORT CENTER *(Part 4 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Support Center Coordinator ◆			
Chemistry Technician			
Electrical Maintenance Technician			
Fire Protection / EMT			
Instrumentation and Control Technician			
Mechanical Maintenance Technician			
Radiation Protection Technician ◆			
Radiological Monitoring Technician			
Repairs Coordinator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.6 Form EP-0011, Personnel Shift Staffing, page 5 of 5 (sample)

FORM EP-0011 D PVNGS EMERGENCY PLANNING

EMERGENCY OPERATIONS FACILITY *(Part 5 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Emergency Operations Director ◆			
Administrative and Logistics Coordinator			
Administrative Support (two)			
Dose Assessment Health Physicist ◆			
Government Liaison ◆			
Information Coordinator			
Radiation Protection Support Technician			
Radiological Assessment Communicator			
Radiological Assessment Coordinator ◆			
Security Coordinator ◆			
Shift Technical Advisor			
Systems Engineering			
Technical Analysis Manager ◆			
USNRC Liaison Health Physics			
OTHER:			
Ass't Emergency Operations Director			
Facility Advisor			
Plant Status Technician			

◆ - position required for facility activation

2.7 Form EP-0012, Emergency Action Log (sample)

FORM EP-0012A PVNGS EMERGENCY PLANNING

EMERGENCY ACTION LOG

Name:	Position:	Facility:	Date:

TIME	ACTION

F_EP0012.DOC 08/01/99 22:54:46

2.8 Form EP-0013, Duty Contact Register (sample)

FORM EP-0013a **PVNGS EMERGENCY PLANNING**

DUTY CONTACT REGISTER

INSTRUCTIONS

NOTE: Per 10 CFR 26.20(e), any individual offsite reporting for duty in the TSC and/or EOF shall be questioned on Fitness for Duty and the response(s) shall be recorded.

Complete the following information:

- print the following: Individual name / current time / facility where reporting
- record both responses to the following questions in the appropriate blanks:

Question 1: *"Have you abstained from alcohol for the past 5 hours?"*
Question 2: *"Are you fit for duty?"*

Name of Individual	*Time*	*For Facility...*	*Response(s) to Questions*
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -

Reviewed by: ______________________ Date: ______________
(Signature)

Reviewer: Review / sign this form and submit it to the EC or EOD when completed. Ensure that the facility leader for each individual reporting for duty is made aware of any individual's condition where alcohol has been consumed.

2.9 Form EP-0021, FAX Cover (sample)

FORM EP-0021A **PVNGS EMERGENCY PLANNING**

ARIZONA PUBLIC SERVICE COMPANY

Palo Verde Nuclear Generating Station

FAX Cover Sheet

TO: ______________________________

PHONE: ______________ | ______________
VOICE FAX

FROM: ______________________________

PHONE: ______________ | ______________
VOICE FAX

PAGES: ______________________________
INCLUDING FAX COVER SHEET

Emergency Planning

2.10 Form EP-0022, EOF Document Distribution (sample)

FORM EP-0022A **PVNGS EMERGENCY PLANNING**

EOF DOCUMENT DISTRIBUTION

Name: ______________________ **Date:** ____________ **Time:** ____________

Retrieve Form EP-0381 and the MESOREM print report from the RAC / Dose Assessment Health Physicist workstations and proceed to the copy machine. Make the following number of copies:

Form EP-0381: 12
MESOREM print report: 5 *(original may be several pages)*

Return the originals to the RAC / Dose Assessment Health Physicist workstations.

Distribute copies of both documents per the following lists *(some copies must be transmitted via FAX)*:

DOCUMENT	POSITION TITLE	COPIES	
Form EP-0381:	Arizona Radiation Regulatory Agency *(TOC)*	1	
	Emergency Operations Director *(EOF)*	1	
	Government Liaison *(EOF)*	1	
	Radiation Protection Support Technician *(EOF)*	1	
	Radiation Protection Technician *(OSC)*	1	
	Radiological Assessment Communicator *(EOF)*	1	
	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	Radiological Status Board *(EOF)*	1 ★	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	
MESOREM Print Report:	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	

★ replace the old form

2.11 Form EP-0030, Chemistry Status (sample)

FORM EP-0030 A **PVNGS EMERGENCY PLANNING**

CHEMISTRY STATUS

Name:	Date:	Time:
SAMPLE ANALYSES		
Reactor Coolant System	***Containment***	***Secondary***

POST ACCIDENT SAMPLING EVALUATION
RCS:
Containment:
RU-144:
RU-146:

STEAM GENERATOR HYDROGEN BUBBLE	**RECOMMENDATION TO REDUCE STEAM GENERATOR HYDROGEN**
#1 Steam Generator: Y (____ %) N	
#2 Steam Generator: Y (____ %) N	

COUNT ROOM STATUS

OTHER INFORMATION

2.12 Form EP-0051, Chemistry Cart #1 Preparation Checklist (sample)

FORM EP-0051 B **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #1 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This cart preparation can be used for obtaining either liquid or gas samples

MATERIALS	✓
Modified lead brick *(made to contain three 7-ml liquid vials)*	
Modified lead brick *(made to contain three 9.2-cc gas vials)*	
Adjustable pipettes *(with pipette tips)* in ranges to allow for sample distribution and dilutions	
Beaker with de-ionized water *(≥ 50 ml)*	
2 gas-tight *(twist-lock)* 1-cc syringes	
10-ml liquid syringe with a 1½-inch needle	
Plastic paper / plastic bags / parafilm to hold the 7-ml / 9.2-cc gas vial after final dilution and prior to counting	
Labels for chemistry samples	
1-inch thick lead carrying case *(pig)*	
Absorbent paper	
Three 9.2-cc gas vials with septums *(one of them evacuated by 0.1 cc)*	
Three 7-ml liquid vials with screw caps	
Needle-nose pliers	
Parafilm	
Lead bricks *(place one lead brick in front and one behind each of the modified dilution lead bricks)*	
Calculator	
Scissors	

COMMENTS

Prepared by: ______________________ (Signature) ______________ (Date)

2.13 Form EP-0052, Chemistry Cart #2 Preparation Checklist (sample)

FORM EP-0052A **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #2 PREPARATION CHECKLIST

Name:	Date:	Time:
NOTE: This cart preparation can be used for obtaining either liquid or gas samples as designated		

MATERIALS	
LIQUID:	
1-ml *(B-D)* liquid syringe	
6-inch syringe needle	
2-inch thick lead pig *(fabricated for a 3½-ml glass vial)*	
3½-ml glass vial	
Parafilm	
Temporary syringe disposal cask	
500-ml beaker *(for temporary disposal of used pipette tips, needles, etc.)*	
GAS:	
2 gas-tight *(twist-lock)* 1-cc syringes	
1-inck thick lead syringe carrying case	
Temporary syringe disposal cask	
Remote tools *(two sets may be needed if transporting to an Unaffected Unit)*	
Gas syringe carrying case *(aluminum case to accommodate syringe and handling tool)*	
BOTH - REMOTE TOOLS:	
Syringe handling tool *(two sets may be needed for gas sampling if a gas sample is to be transported to an Unaffected Unit)*	
Syringe locking / unlocking device	

COMMENTS

____
____
____
____
____
____
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Prepared by: ______________________ ______________
(Signature) *(Date)*

2.14 Form EP-0053, Chemistry Cart #3 Preparation Checklist (sample)

FORM EP-0053A **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #3 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This checklist is generally performed by the Radiological Monitoring Technician and can be used for obtaining RMS HI-Range skid samples

MATERIALS	
Sample handling tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Latch handle tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Portable transfer pig	
KEPIC *(if required)*	
Loaded special RMS filter head	
Plastic bags	
Tweezers	
Petri dishes	
RMS keys	

COMMENTS

Prepared by: ______________________ ______________
(Signature) *(Date)*

2.15 Form EP-0054, Accident Sample Worksheet (sample)

FORM EP-0054A **PVNGS EMERGENCY PLANNING**

ACCIDENT SAMPLE WORKSHEET

Name:	Date:	Time:

DOSE DATA

(AS REQUIRED FOR SAMPLE TYPE)	*CONTACT*	*1-FOOT*	*3-FEET*
Septum Ports			
Syringe			
RMS Skid Working Area			
RMS Sample Chamber *(door open)*			
Top of Unshielded Sample in Pig			
Pig Top			
Pig Side			

SAMPLE DATA LOG

(AS REQUIRED FOR SAMPLE TYPE)

RU-________ Chamber # ________ Sample Volume ____________________ Cubic Feet
(original volume uncorrected for iodine plate-out)

Grab Sample Collection Duration ________ Seconds

Sample Start: Date: ________ Time: ________ Flow: ________ CFM

Sample Stop: Date: ________ Time: ________ Flow: ________ CFM

TEAM DATA

Team Number: ____________________

Team Members: ____________________ ____________________

____________________ ____________________

____________________ ____________________

COMMENTS

____

____

____

____

____

Prepared by: ____________________ ____________________
(Signature) *(Date)*

2.16 Form EP-0055, RMS Skid Collection Time Calculation (sample)

FORM EP-0055A **PVNGS EMERGENCY PLANNING**

RMS SKID COLLECTION TIME CALCULATION

Name:	Date:	Time:

RMS SKID SAMPLE DATA
SAMPLE COLLECTION TIME CALCULATION

Monitor Number: ______________

Monitor Reading *(M)*: ______________ µCi/cc Sample Flow: __________ CFM

Collection Time *(seconds)* Calculation:

$$T_{sec} = \frac{\text{Sample } (\mu Ci)}{(M) \times (R) \times (F) \times (472) \times (0.04)}$$

where:

T_{sec} and Sample µCi are variables - either a specific sample time or a specific sample activity may be entered and the other variable will be calculated. **Always ensure that the final sample activity will be below the 0.25 Ci sample counting limitation.**

M = current µCi/cc monitor indication

R = ratio of I/NG - use a known value from analysis *(if available)* or as below: *(based on UFSAR 6.3.3.6 Source Term for 100% failed fuel)*

- 2.20E-02 I/NG for LOCA or Fuel Handling Accident
- 5.70E-04 I/NG for S/G Tube Leak condition

F = current sample flow *(not process)* in CFM

472 = net unit conversion factor: *[(cc/sec) divided by (ft^3/min)]*

0.04 = Iodine plate-out factor

NOTE

Select a collection time that is less than the calculated maximum.
If the calculated maximum is less than 60 seconds, use 60 seconds as the minimum time.

Calculated T value: _______ seconds Selected T value to be used: _______ seconds

Calculated by: ______________________________ Date: __________
(Signature)

Print Name: ______________________________

Reviewed by: ______________________________ Date: __________
(Signature)

2.17 Form EP-0130, Plant Maintenance Status (sample)

FORM EP-0130A **PVNGS EMERGENCY PLANNING**

PLANT MAINTENANCE STATUS

Name:	Date:	Time:

EQUIPMENT STATUS	
Damage	**Repair Effort*(s)***
Electrical:	Repair Team:
Mechanical:	Repair Team:
Instrumentation:	Repair Team:

TOOLS / SPARE PARTS
HAZARDS
Chemical:
Fire:
Medical:
Toxic:
WATER SUPPLY STATUS
Primary Systems:
Secondary Systems:
Spray Pond*(s)*:
MISCELLANEOUS
Radiological Condition*(s)*:
Decontamination:
Support Personnel:
TSC Panel AJ-SDN-UA-001 Status:

2.18 Form EP-0131, In-plant Team Briefing (sample)

FORM EP-0131A **PVNGS EMERGENCY PLANNING**

IN-PLANT TEAM BRIEFING

OSC Coordinator

TEAM IDENTIFICATION	Team Members: *(Ldr)*:
Team Name:	
Plant Location:	
Purpose:	

Radiation Protection

EXPECTED WORK AREA CONDITIONS	
REP Number:	Dose Rates:
Contamination:	Airborne: Respirator: Y N
PROTECTIVE REQUIREMENTS (In addition to those specified on REP)	
Dosimetry:	
PCs:	
Communications Links:	
SPECIAL INSTRUCTIONS	
Are Emergency Exposure/KI actions required for any team member? Y N	
If Y*(es)*, has required documentation been completed? Y N	
Hold Points:	
Abort Points Dose Rate: Dose: Time: Other:	

OSC Coordinator / Radiation Protection

BRIEFING	
Travel Route Summary:	
Personnel Hazards:	
Tools / Equipment:	
Additional Materials:	
Time Briefing Conducted:	Time Team Dispatched:
Conducted by:	Time Team Returned:
DEBRIEF COMMENTS	

2.19 Form EP-0231, Draft Information - NUE (sample)

FORM EP-0231 A PVNGS EMERGENCY PLANNING

NOTIFICATION OF UNUSUAL EVENT

DRAFT INFORMATION

Wintersburg, AZ – A Notification of Unusual Event was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Injuries - describe and indicate if contaminated**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material.

2.20 Form EP-0232, Draft Information - Alert (sample)

FORM EP-0232A PVNGS EMERGENCY PLANNING

ALERT

DRAFT INFORMATION

Wintersburg, AZ -- An Alert was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material *(if applicable)*.

2.21 Form EP-0233, Draft Information - SAE (sample)

FORM EP-0233A PVNGS EMERGENCY PLANNING

SITE AREA EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A Site Area Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.22 Form EP-0234, Draft Information - GE (sample)

FORM EP-0234A **PVNGS EMERGENCY PLANNING**

GENERAL EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A General Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.23 Form EP-0235, Site-Wide Announcement Worksheet (sample)

FORM EP-0235A **PVNGS EMERGENCY PLANNING**

SITE-WIDE ANNOUNCEMENT WORKSHEET

Name:	Facility:	Date:	Time:

INSTRUCTIONS

Complete the relevant blanks with a summary of information and perform a Site-Wide Announcement. Strike out any portions not applicable to the event.

Attention all plant personnel -- Attention all plant personnel.

On ______ *date* **at** ______ *time*, **a(n)** ______ *emergency classification* **was declared in Unit** ______ *Unit* **due to** ______ *reason (see applicable EAL Status Codes)*.

Corrective actions applied have been ______ *summary of corrective actions* ______.

The current plant status is ______ *information summary*.

A radiological release is is not **in progress at this time.**

The wind is currently from the ______ *direction* **at** ______ *speed* **miles / hour.**

The current Protective Action Recommendation provided to the State of Arizona is:

______ *from Emergency Operations Director or designee*.

Personnel injuries include ______ *number and nature of injuries*.

Fire / hazardous chemical status is ______ *information summary*.

Personnel Assembly was directed on ______ *date* **at** ______ *time*.

Site Evacuation was directed on ______ *date* **at** ______ *time*.

Specific instructions: ______ *information summary*

2.24 Form EP-0240, EC Turnover Summary (sample)

FORM EP-0240A **PVNGS EMERGENCY PLANNING**

EC TURNOVER SUMMARY

Onshift EC Name: ______________________ Date: __________

Onsite EC Name: ______________________ Time: __________

CURRENT CONDITIONS

Emergency Classification declared at: __________ (date) __________ (time) in Unit: ____

EAL Status Code(s):

Initiating Event Summary:

Summary of Plant Status:

Procedure(s) in Use:

Corrective Action(s) Applied:

CRITICAL SAFETY FUNCTION STATUS

Safety Function(s) Currently Jeopardized:

PROTECTIVE ACTION RECOMMENDATIONS

Radiological Release? (Y/N): Describe:

PAR issued: at: __________ (date) __________ (time)

State Protective Action Decision:

Medical / Fire / etc? (Y/N): Describe:

OTHER INFORMATION

2.25 Form EP-0300, Authorization for Dose Beyond 10CFR20 limits (sample)

FORM EP-0300A **PVNGS EMERGENCY PLANNING**

AUTHORIZATION FOR DOSE BEYOND 10CFR20 LIMITS

Name:	Date:	Time:	Unit:

ORIGINATOR

Authorization Requested For:

Individual Name: ____________

HPID: ________ SSN: ____________ REP Number: ____________

Reason for Request: ______________________________

DOSE REQUEST

Circle one limit in each column or enter a lower limit in the appropriate box of each column:

DOSE LIMITS	TEDE	TODE and Thyroid CDE	LDE	SDE
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM / year	50 REM ★ / year	15 REM / year	50 REM / year
EPA Guidance for Protecting Valuable Property	10 REM	100 REM	30 REM	100 REM
EPA Guidance for Life-Saving or Protection of Large Populations	≤ 25 REM	≤ 250 REM	≤ 75 REM	≤ 250 REM
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM	> 250 REM	> 75 REM	> 250 REM

★ Sum of Deep Dose Equivalent and Committed Dose Equivalent *(DDE + CDE)*. EPA does not use TODE *(Total Organ Dose Equivalent)*; EPA uses CDE in this column. PVNGS assesses TODE and, via Emergency Exposure and KI guidelines and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

AUTHORIZATION AND APPROVAL

<u>NOTE</u>: **For dose authorizations > 25 REM, a risk discussion is required per 16IG-0EP051, Emergency Exposures and KI, Section 6, Team Briefing and Deployment, if time permits.**

I have received <u>NO</u> previous life-saving exposure: ____________ *(radiation worker signature)* ______ *(date)*

If authorized dose > 25 REM, my assignment is voluntary and I have received a risk discussion briefing: ____________ *(radiation worker signature)* ______ *(date)*

I have reviewed my dose records. I am aware that, although dose received under this authorization is beyond 10 CFR 20 limits during the emergency, the dose received will be added to my dose records and subject to 10 CFR 20: ____________ *(radiation worker signature)* ______ *(date)*

Radiation Protection Monitor / Radiological Protection Coordinator: ____________ *(RPM / RPC signature)* ______ *(date)*

Authorized for dose requested as stated above: ____________ *(Emergency Coordinator signature)* ______ *(date)*

DOSIMETRY RECORD UPDATE

Dosimetry record update performed by:

____________ *(print)* ____________ *(signature)* ______ *(date)* ______ *(system)*

2.26 Form EP-0301, TLD Distribution (sample)

FORM EP-0301 A **PVNGS EMERGENCY PLANNING**

TLD DISTRIBUTION

Monitor Name:	***Date:***
Location:	

Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		

2.27 Form EP-0330, Plant Status Overview (sample)

FORM EP-0330 **PVNGS EMERGENCY PLANNING**

PLANT STATUS OVERVIEW

TIME: DATE: EMERGENCY CLASS: PALO VERDE UNIT: Mw CE POWER:

REACTOR	PRIMARY COOLANT	ECCS	SECONDARY PLANT	CONTAINMENT	ELECTRICAL
POWER LEVEL: TREND	RCP AUX. AVAIL. (Y/N)	SIAS (Y/N):	STEAM GENERATORS	CIAS (Y/N):	OFFSITE AC (Y/N):
%	1A 1B 2A 2B	HPSI PUMPS RUNNING(Y/N):	LEVEL (% WR):	CSAS (Y/N):	ONSITE POWER (Y/N):
CORE EXIT TEMP:	RCP's RUNNING (Y/N):	SIA SIB	1 2	ISOLATED (Y/N):	DIESEL GENERATORS:
°F	1A 1B 2A 2B	HPSI FLOW (GPM):	PRESSURE (PSIA):	PRESSURE: TREND	A: VAC
HIGHEST INCORE THERMOCOUPLE TEMP:	LOOP T-COLD (°F):	1A: 1B:	1 2	PSIG	B: VAC
°F	1A 1B 2A 2B	2A: 2B:	ISOLATED (Y/N):	TEMPERATURE:	VITAL BUS STATUS:
RX VESSEL WATER LEVEL:	LOOP T-HOT (°F):	HL1: HL2:	1 2	°F	PBAS03: VAC
HEAD %	1 2	CHARGING FLOW:	MAIN FEED FLOW (LBM/HR):	H^2 CONCENTRATION (%)	PBBS04: VAC
PLNM %	TEMP SUBCOOL: TREND	GPM	1 2	A: B:	125 VDC:
SHUTDOWN (Y/N):	°F	LPSI PUMPS:	AUXILIARY FEEDWATER	CONTAINMENT SPRAY:	PKA PKB
CONTROL RODS IN (Y/N):	PRESSURIZER PRESSURE:	A: GPM	RUNNING:	A: B:	PKC PKD
COOLING METHOD:	PSIA	B: GPM	A / B / N	SUMP LEVEL: TREND	UPS STATUS:
	PRESSURIZER LEVEL:	RWT LEVEL: TREND	AUX FEED FLOW:	A: IN	
EMERGENCY BORATE (Y/N):	%	%	SG1: GPM	B: IN	
	PRESSURIZER TEMP:	SIT LEVEL (% WR):	SG2: GPM	RADIATION:	
BORON CONC (ppm):	°F	1A 1B	TOTAL FLOW: TREND	RU148 mR/HR	
	RDT LEVEL: %	2A 2B	SG1: GPM	RU149 mR/HR	
	LEVEL CONTROL METHOD:		SG2: GPM	RECOMBINERS (Y/N):	
			CST LEVEL: FT	A: B:	
	GAS CONC (CC stp/kg):		ADVs IN USE (Y/N):	AIR COOLERS:	
	H^2 N^2 Xe Kr		SBCS IN USE (Y/N):	A B C D	
	SPEC ACTIVITY (uCi/ml):			SPEC CONC (uCi/ml):	
	TOTAL: I:			TOTAL: I:	

COMMENTS:

2.28 Form EP-0350, Radiological Status (sample)

FORM EP-0350A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL STATUS

Date: Time: Accident Unit *(1 / 2 / 3 / common)*:

RELEASE PATH USED FOR PROJECTION

- ☐ Steam Generator Tube Rupture *(1% failed fuel)*
- ☐ Steam Generator Tube Rupture *(100% failed fuel)*
- ☐ LOCA *(1% failed fuel)*
- ☐ LOCA *(100% failed fuel)*
- ☐ Isolated Containment
- ☐ Fuel Handling Accident
- ☐ Waste Gas Decay Tank Accident
- ☐ Unmonitored Release Accident

Emergency initially declared: Time *(hh:mm)*: ____________ Date *(mm/dd/yy)*: ____________

Is a release currently in progress? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: ____________

Release rate *(if known)*: Iodine: ____________ µCi/sec Noble Gas: ____________ µCi/sec

Simultaneous release? ☐ Yes ☐ No

Expected total release duration *(hh:mm)*: ____________ *(default = 02:00)*

Has the reactor been scrammed? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: ____________

METEOROLOGICAL DATA

Weather: ☐ Normal ☐ Adverse Wind Speed is ________ *(at 35 feet)* mph from ________ *(at 35 feet)* degrees

Δ-T: ________ Ambient temperature: ________

CURRENT RADIATION MONITORING SYSTEM DATA

RMS Monitor: ____________ RMS Monitor Reading: ____________ µCi/cc or ____________ mrem/hr

Process Flowrate: ____________ cfm Iodine Filtration: ____________ % *(default = 95%)*

Grab sample analysis: ☐ Complete *(see below)* ☐ Incomplete

MISCELLANEOUS INFORMATION

Isolated Containment *(leakage)*: ☐ 852 cc/sec *(default)* ☐ Other: ____________ cc/sec

NOTE: Maximum steam flow *(or 100% open valve position)* will result in a very conservative release projection. Validate the release projection with field team data as soon as practicable.

S/G Tube Rupture: Affected loop Hot Leg temperature *(if steam release from S/G)*: ________ °F

Affected steam line flow rate: ____________ lbm/hr *(from ERFDADS or CR)*

S/G level > 97% WR or indication of liquid entrained release? ☐ Yes ☐ No

Fuel Handling Accident: Fuel assembly age *(time since last critical)*: ________ hours *(from Rx Eng or STA)*

Waste Gas Decay Tank: Elapsed time since isolated: ________ hours *(maximum 999 hours)*

GRAB SAMPLE ANALYSES

Sample Number: ____________ Sample analysis time *(hh:mm)*: ____________

Comments:

Name: ____________ *(print)* Position: ____________ *(ERO)*

2.29 Form EP-0381, Dose Projected PAR (sample)

FORM EP-0381 c **PVNGS EMERGENCY PLANNING**

DOSE PROJECTED PAR

Date: ____________ Time: ____________

A release at this time is *(circle one)*: **in progress** **not in progress**

The release is *(circle one)*: **monitored** **unmonitored** **N/A**

The release is *(circle one)*: **filtered** **unfiltered** **N/A**

The release pathway is *(check all that apply)*:

☐ Containment ☐ Plant Vent ☐ Fuel Building ☐ Steam Line ☐ N/A

☐ Other: ____________________________

RMS Monitor: ____________ RMS Monitor Reading: ____________

The expected release duration is: ______ hours *(default = 2 hours)*

15 minute average wind speed is ________ *(at 35 feet)* mph from ________ *(at 35 feet)* degrees

MESOREM projected Stability Class is *(circle one)*:

A B C D E F G

(unstable) *(neutral)* *(stable)*

MESOREM projected Mixing Depth: ________ meters

MESOREM projected release rates *(μCi/sec)* are:

Iodine: ____________ Noble Gas: ____________

Time since scram: _____ Hrs _____ Min *(from STA)* Release in progress: _____ Hrs _____ Min *(from STA)*

The plume centerline projected dose *(in mrem)* based on a _____ - hour release is:

Distance	Sector(s)	TEDE	Thyroid CDE	TODE
SB	______	______	______	______
2 miles	______	______	______	______
5 miles	______	______	______	______
10 miles	______	______	______	______

NOTE: As a minimum, enter data for the Site Boundary (SB) fields.

PAR: ____

2.30 Form EP-0481, Air Sample Data (sample)

FORM EP-0481 B **PVNGS EMERGENCY PLANNING**

AIR SAMPLE DATA

Sample Number:	Sample Date:	Sample Time:
Sample Location:		

PARTICULATE

Filter *(net cpm)*	X	Calculation Constant ★	=	Particulate Concentration	
____________	X	1.6E-11	=	____________	µCi/cc

IODINE *(Label Iodine cartridge for transport to laboratory)*

If frisker is on-scale, Silver Zeolite *(net cpm)*	X	Calculation Constant ★	=	Iodine Concentration	
____________	X	3.2E-11	=	____________	µCi/cc

If frisker is off-scale-HI, obtain a closed-window RO-2 contact reading *(mrem/hr)* on the cartridge and multiply the RO-2 reading by the appropriate conversion factor and by 1.0E-06 to obtain a µCi/cc value:

(RO-2 closed-window reading) X (Conversion Factor) X (1.0E-06) = (I^{131} Equiv. Concentration in µCi/cc),

____________ X ________ X 1.0E-06 = ____________ µCi/cc

Multiply the I^{131} Equiv. Concentration by 1.3E+06 to obtain the equivalent Thyroid CDE dose rate:

____________ µCi/cc *(previous line)* X 1.3E+06 = ____________ REM / hour

Hours Since Reactor Shutdown:	0 - 4	5 - 7	8 - 12	13 - 18	19 - 24	25 - 36	> 36
Conversion Factor:	2	3	4	6	7	10	20

NOBLE GAS *(Label Noble Gas samples for transport to laboratory)*

★ The displayed Calculation Constant is based on an assumed sample volume of 10 cubic feet. For sample volumes other than 10 cubic feet, multiply concentration by 10 and divide by actual sample volume *(cubic feet)*.

2.31 Form EP-0482, Field Team Survey (sample)

FORM EP-0482 **PVNGS EMERGENCY PLANNING**

FIELD TEAM SURVEY

DATE:

		DOSE RATES *(mrem/hr)*				AIR SAMPLES	
		3 FEET		3 INCHES		*(μCi/cc)*	*(μCi/cc)*
TIME	LOCATION	WO	WC	WO	WC	PART	IODINE

2.32 Form EP-0483, Field Team Plume Sample (sample)

FORM EP-0483 B PVNGS EMERGENCY PLANNING

FIELD TEAM PLUME SAMPLE

RFAT NUMBER:	TIME:	
PLUME LOCATIONS		
1. EDGE:		
2. CENTERLINE:		
3. EDGE:		
CENTERLINE SURVEY DATA		
	3 FEET	3 INCHES
OPEN WINDOW *(mrem/hr)* - GROSS UNCORRECTED READING -		
CLOSED WINDOW *(mrem/hr)*		

PARTICULATE CONCENTRATION	=	______	µCi/cc
divided by 3.00E-09 µCi/cc per DAC	=	______	DAC
times 2.5 mrem/hr per DAC	=	______	mrem/hr CEDE
IODINE CONCENTRATION	=	______	µCi/cc
divided by 2.00E-08 µCi/cc per DAC	=	______	DAC
times 25 mrem/hr per DAC	=	______	mrem/hr Thyroid CDE

TEAM EXPOSURE		
NAME:		
EXTERNAL EDE *(mrem)*		
DAC-Hours		
Time in Plume		

(Authorized TEDE X selected External EDE / TEDE ratio = Allowed External EDE mrem)

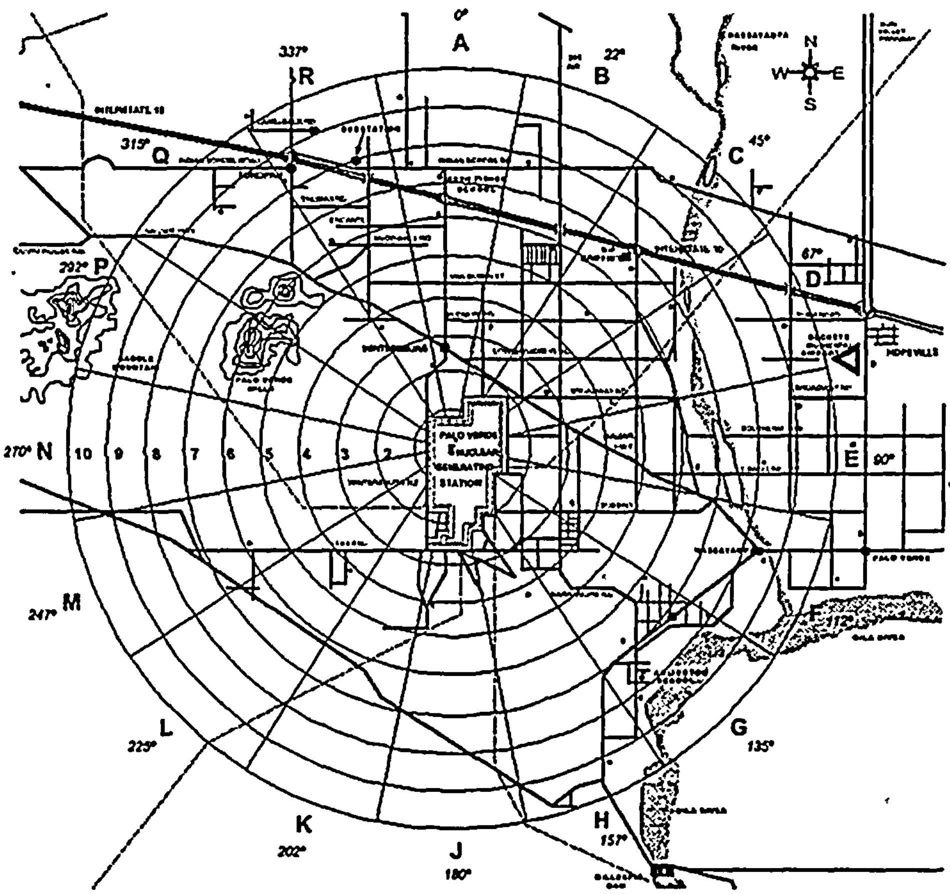
OTHER INFORMATION

NOTE: Information for identified fields represents the minimum to be reported

2.33 Form EP-0484, Plume Data Map (sample)

FORM EP-0484A **PVNGS EMERGENCY PLANNING**

PLUME DATA MAP



DATE: __________ TIME: __________ Rx TRIP TIME: __________

START OF RELEASE: __________ (DATE) __________ (TIME) STABILITY CLASS: __________

WIND: __________ MPH FROM __________

2.34 Form EP-0500, Radiological Protection Summary (sample)

FORM EP-0500A **PVNGS EMERGENCY PLANNING**

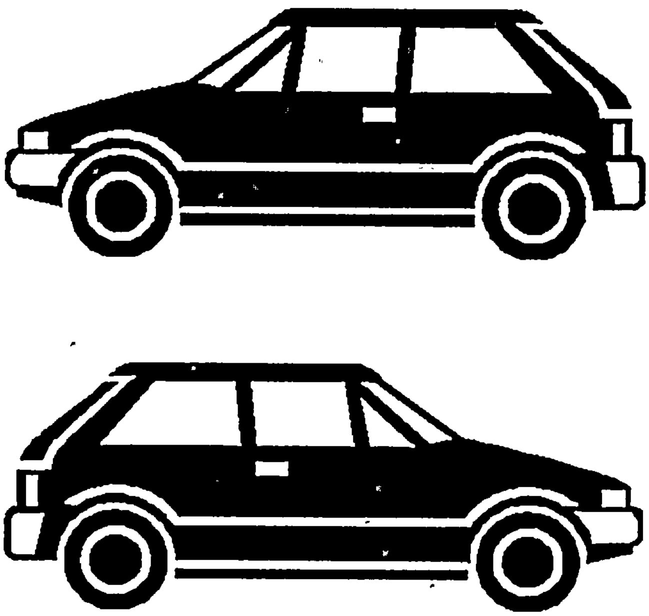
RADIOLOGICAL PROTECTION SUMMARY

DATE:	TIME:
EMERGENCY CLASSIFICATION: NUE ALERT SAE GE	
Radiological Events Driving Classification:	
Radiological Status: • A release IS IS NOT in progress at this time from ______________ *(release point)* • Current wind speed is _______ mph at 35' elevation from _______ degrees at 35' elevation	
Corrective Actions Implemented:	
PVNGS PROTECTIVE ACTION RECOMMENDATIONS	***GOVERNMENT PROTECTIVE ACTION DECISIONS***
Plant Activities (circle appropriately): • ASSEMBLY ACCOUNTABILITY EVACUATION • CONTAMINATED INJURIES LIFE-THREATENING INJURIES • OTHER:	

2.35 Form EP-0501, Vehicle Decontamination (sample)

FORM EP-0501 A **PVNGS EMERGENCY PLANNING**

VEHICLE DECONTAMINATION

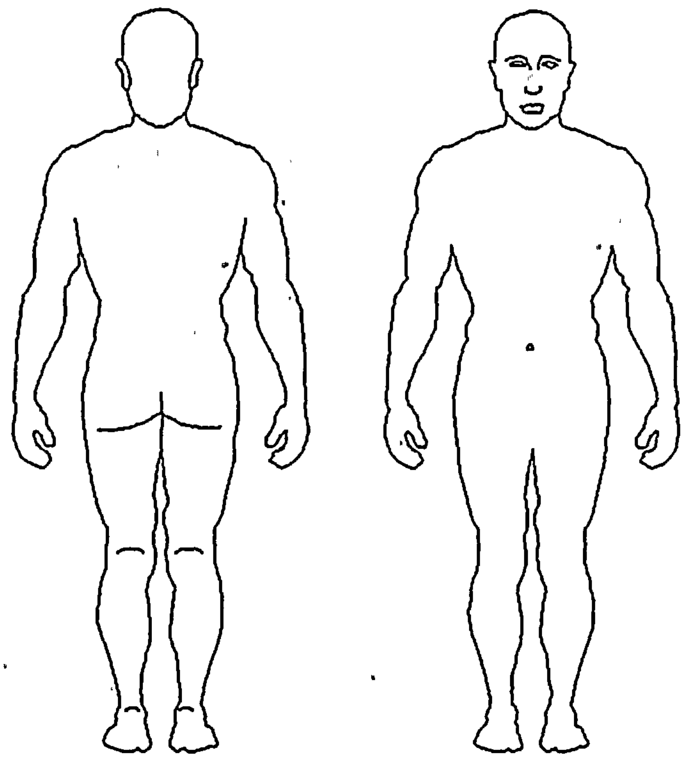


Monitor Name:		Date:	Time:
Vehicle Reg:	Owner:	Address:	
City:	State: ZIP:	Telephone:	
CONTAMINATION			
Location Outside Vehicle (describe):			
Location Inside Vehicle (describe):			
Location In Engine Compartment (describe):			
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*			
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*			
Vehicle Impounded YES NO	*Item(s) Impounded:*		

2.36 Form EP-0502, Individual Body Decontamination (sample)

FORM EP-0502A **PVNGS EMERGENCY PLANNING**

INDIVIDUAL BODY DECONTAMINATION



Monitor Name:		Date:	Time:
Patient Name:		Address:	
City:	State:	ZIP:	Telephone:
CONTAMINATION			
Location on Clothing (describe):			
Location on Body (describe):			
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*			
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*			
Item(s) Impounded:			

2.37 Form EP-0503, KI Distribution (sample)

FORM EP-0503A **PVNGS EMERGENCY PLANNING**

KI DISTRIBUTION

Name:	SSN:	Work Group:
Reason For Dispensation:		
DISPENSATION DATA		
Date:	Time:	Milligrams:

EC APPROVED *(circle one)*: Y N ______________________ *(ADMINISTERING INDIVIDUAL SIGNATURE)*

WORKER: I have reviewed the information below, I am aware of the potential health hazards involved with KI usage, and my usage hereunder is voluntary: ______________________ *(SIGNATURE)*

Potassium Iodide *(KI)*, a stable Iodine, may be used in the event of a radiological emergency as a blocking agent to prevent the uptake of radioactive Iodine by the thyroid gland, which depends upon Iodine for the synthesis of thyroid hormones. Iodine is normally supplied to the thyroid gland through dietary intake. However, the thyroid is capable of absorbing and storing only a limited amount of Iodine. Excess amounts ingested are eliminated by urination. Therefore, the use of stable Iodine will limit thyroid exposure by blocking the uptake of radioiodine by the thyroid, leading to elimination of radioactive Iodine from the body.

The use of Potassium Iodide does present some risk to the user in the form of side effects, allergic reactions, or other contraindications. Allergic reactions leading to severe illness may occur for individuals with unusual sensitivity to Iodine or those with pre-existing thyroid disease. Such reactions may include enlargement of the thyroid *(possibly leading to respiratory impairment)*, alterations in body metabolism due to increasing or decreasing thyroidal hormone output, and hypersensitive reactions such as fever, pain in joints, and alteration of blood cell counts. These effects are usually associated with Iodine doses much higher and administered over a longer duration of time than those allowed to be administered by PVNGS Station procedures. Possible side effects include skin rash, swelling of the salivary glands, and Iodism *(metallic taste, burning mouth and throat, sore teeth and gums, head cold symptoms, upset stomach, and possible diarrhea)*. Allergic reactions to low doses are usually limited to angioedema *(swelling or hives)*.

The above represents the extreme. The sensitivity of the average individual to Potassium Iodide at the levels administered is minimal. A good rule is that if no history exists for sensitivity to medication in general nor any for reactions to seafood or shellfish, then there should be no reaction to 130 mg of Potassium Iodide administered as one tablet once per day.

Potassium Iodide may be taken along with other medications prescribed for thyroid problems *(e.g., thyroid hormone, antithyroid medications)*. Pregnant and nursing women, babies, and children may also take this drug. Additional questions may be clarified by reading Appendices B and C of EPA-400, available at Emergency Planning. Although the Food and Drug Administration has endorsed the use of Potassium Iodide, the risks associated with low dosages of Potassium Iodide for thyroid blocking in a radiation emergency may outweigh the risks associated with radioiodine induced thyroid nodules or cancer. For this reason, THE USE OF POTASSIUM IODIDE BY EMERGENCY WORKERS SHALL BE ON A VOLUNTARY BASIS.

Potassium Iodide may only be authorized by the Emergency Coordinator for use by volunteers when the projected Thyroid CDE dose is 25 REM or greater. Emergency workers may be APS or non-APS employees at the facility. Under emergency conditions, volunteer approvals and briefings may be obtained or performed locally and telecommunicated to expedite the response. Follow-up monitoring of all individuals issued Potassium Iodide must be performed in cases where actual exposure to radioactive Iodine did occur. This is necessary to maintain the thyroid blocking action by additional Potassium Iodide doses until the Iodine activity decays. Follow-up monitoring of all individuals issued Potassium Iodide must also be performed in all cases for possible side effects from the Potassium Iodide.

FOLLOW-UP DATA

Was individual actually exposed to radioactive Iodine? Y N

If Y(es), furnish additional information regarding subsequent KI administration, air sample data, Whole Body count data, and any other information appropriate to determination of actual Thyroid CDE:

Reviewed by: ______________________ Title: ______________________

2.38 Form EP-0511, Core Exit Thermocouple CDA, page 1 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

CORE EXIT THERMOCOUPLE CDA

DATE:	TIME:	UNIT:	CYCLE:

1) MAXIMUM CET TEMPERATURE

Date of temperature reading:	Maximum CET Temperature:
Time of temperature reading:	Reactor Vessel Pressure:

2) FUEL RODS RUPTURED (%)

Using the Reactor Vessel Pressure *(from above)* and the Maximum CET Temperature *(from above)*, determine the percent of fuel rods ruptured using Core Damage Assessment, Figure 1 *(attached)*.

Percent of Fuel Rods Ruptured *(from Figure 1)*: ____________

3) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Core Exit Thermocouple methodology yields damage estimates in Categories 1, 2, 3, and 4.

The result recorded above is likely a lower limit estimate.

The Noteworthy Items from 16IG-0EP031, Core Damage Assessment, Section 1, Introduction, should be read and understood prior to making a determination.

Using the percent of fuel rods ruptured, the Clad Damage Characteristics from Core Damage Assessment, and engineering judgment, determine the USNRC Category of Fuel Damage.

USNRC Category of Fuel Damage: ____________

4) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

5) COMMENTS

2.39 Form EP-0511, Core Exit Thermocouple CDA, page 2 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

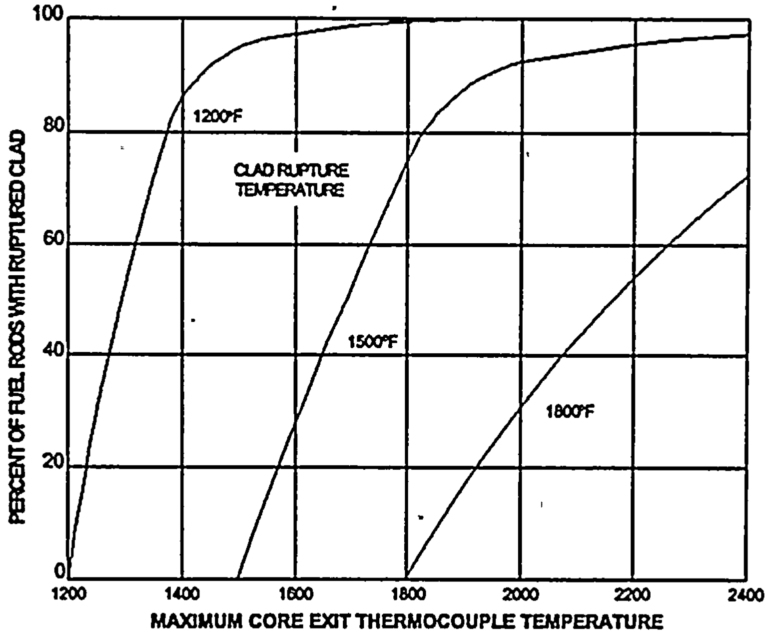
CORE EXIT THERMOCOUPLE CDA

NOTE

Figure taken from Core Damage Assessment, Figure 1

FIGURE 1

PERCENT OF FUEL RODS WITH RUPTURED CLAD vs MAXIMUM CORE EXIT THERMOCOUPLE TEMPERATURE



When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

2.40 Form EP-0512, Containment RMS CDA, page 1 of 3 (sample)

FORM EP-0512B **PVNGS EMERGENCY PLANNING**

CONTAINMENT RMS CDA (Part 1 of 2)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) PLANT POWER CORRECTION

If reactor power has not been steady over the 30 days prior to reactor shutdown, engineering judgment is required to determine the most representative power level to be used.

This judgment should consider the following guidelines:

- The average power during the 30 days is not necessarily the most representative value.
- The power levels at which the reactor last operated should weigh more heavily than earlier power levels.
- Continued operation at one power level should weigh more heavily than brief transient levels.
- In the case in which the reactor has produced power for less than 30 days, the estimate of core damage obtained could under-predict the actual conditions.

Record the prior 30-day power history:

POWER *(%)*	DURATION *(days)*

Using engineering judgment, determine the most representative power to be used in the power correction factor and record below:

Representative Power: ________ %

100 / Representative Power = Power Correction Factor *(PCF)*

100 / Representative Power = ______ *(PCF)*

3) DOSE RATE CORRECTION

Record the dose rates of each Containment radiation monitor and, using the Power Correction Factor *(PCF)* calculated in Step 2 *(above)*, calculate a corrected dose rate for each radiation monitor.

NOTES: RU Monitors read in REM / hour. In this case, REM / hour is equivalent to RAD / hour.
RU-148 and RU-149 are the Containment HI-Range monitors located at elevation 140' in Containment.

MONITOR ID	DATE / TIME	HRS SINCE SHUTDOWN	DOSE RATE *(RADS/HR)*	CORRECTED DOSE RATE *(DOSE RATE x PCF)*
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				

2.41 Form EP-0512, Containment RMS CDA, page 2 of 3 (sample)

FORM EP-0512B **PVNGS EMERGENCY PLANNING**

CONTAINMENT RMS CDA (Part 2 of 2)

DATE:	TIME:	UNIT:	CYCLE:

4) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Radiation Monitors methodology yields damage estimates in Categories 2 through 7 only.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using Core Damage Assessment, Figure 2 *(attached)*, the time since reactor shutdown, the corrected dose rates, engineering judgment, and the Dose Rate Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

MONITOR ID	USNRC CATEGORY OF FUEL DAMAGE
RU-148	
RU-149	

5) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

6) COMMENTS

2.42 Form EP-0512, Containment RMS CDA, page 3 of 3 (sample)

FORM EP-0512B PVNGS EMERGENCY PLANNING

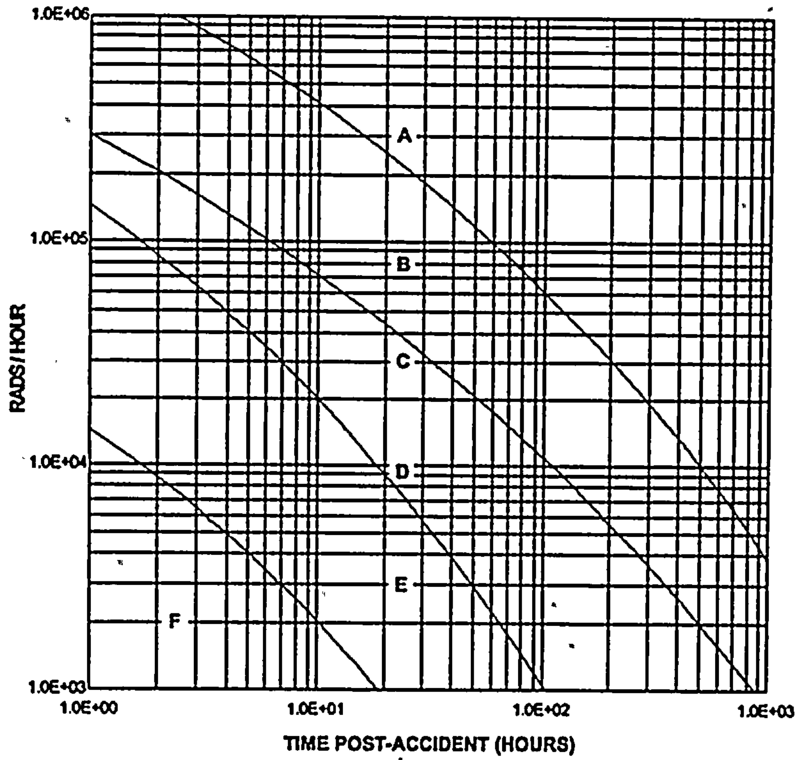
CONTAINMENT RMS CDA

NOTE

Figure taken from Core Damage Assessment, Figure 2

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL



A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

2.43 Form EP-0513, Containment Hydrogen CDA, page 1 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 1 of 5)

DATE:	TIME:	UNIT:	CYCLE:

NOTE: All figures referenced denote those contained in Core Damage Assessment, Figures.

1) CORE UNCOVERING ESTIMATES

INSTRUMENT	ESTIMATED CORE UNCOVERING TIME	ESTIMATED CORE RECOVERY TIME
Reactor Vessel Level Monitoring System	Lower Limit Elevation Uncovers Time: ________	Lower Limit Elevation Recovers Time: ________
Core Exit Thermocouple Temperature	Start of Continuous Rise or Exceed 660°F Time: ________ Temperature: ________	Rapid Temperature Drop to Saturation Time: ________ Temperature: ________
Core Exit Thermocouple Saturation Margin	Start of Superheat *(Use Figure 3)* Time: ________	Return to Saturation or Subcooling Time: ________

2) BEST ESTIMATE

Record the best estimate of core uncovering / recovery times and corresponding system pressure. The pressure recorded for core uncovering will be used in Step 10 in conjunction with Figure 8.

Core Uncovering: Time: ________ Pressure: ________

Core Recovery: Time: ________ Pressure: ________

3) INLET FLOW RATE

Record the approximate vessel inlet flow rates *(GPM)* during the core uncovering heatup period until the time of peak Core Exit Thermocouple *(CET)* temperature is reached.

HPSI Flow Rate: ________ LPSI Flow Rate: ________

Charging Flow Rate: ________ Other Inlet Flows: ________

4) SAMPLES

Obtain an RCS liquid sample and a Containment atmosphere sample *(online H_2 Monitor can be used)* in accordance with 74OP-xSS02 and record the values for the parameters listed below.

NOTE: At least 2 hours is expected between PASS sample request and sample results. It will not be possible to obtain many samples at the same time.

RCS Conditions	Containment Conditions
Sample: Date: ________ Time: ________	Sample: Date: ________ Time: ________
System Pressure: ________ psia	Containment Pressure: ________ psig
Temperature: ________ °F	Temperature: ________ °F
Reactor Vessel Level: ________ %	Hydrogen Concentration: ________ volume %
Pressurizer Level: ________ %	----------------------------------
Hydrogen Concentration: ________ cc/kg @ STP	----------------------------------

2.44 Form EP-0513, Containment Hydrogen CDA, page 2 of 5 (sample)

FORM EP-0513A PVNGS EMERGENCY PLANNING

CONTAINMENT HYDROGEN CDA (Part 2 of 5)

DATE:	TIME:	UNIT:	CYCLE:

5) HYDROGEN SAMPLE DATA REDUCTION

HYDROGEN MEASURED IN CONTAINMENT

$$\text{Containment Hydrogen}\left(\textit{total SCF}\right) = \frac{H_2}{100} \times 2.6E{+}06 \times \frac{(P_c + 14.7)}{14.7} \times \frac{492}{(T_c + 460)}$$

= _____ X 2.6E+06 X _________ X _________ = _________ SCF

Where:

H_2	=	Hydrogen concentration *(volume %)* as measured on Gas Chromatograph *(from Step 4 or H_2 Monitor)*
100	=	Conversion from percent to decimal fraction
2.6E+06	=	Containment volume in cubic feet
P_C	=	Containment pressure in psig *(from Step 4)*
T_C	=	Containment temperature in °F *(from Step 4)*
460	=	Conversion from °F to °R
492	=	Standard temperature in °R
14.7	=	Standard pressure in psia
SCF	=	Standard Cubic Feet

HYDROGEN MEASURED IN RCS

$$\text{RCS Hydrogen}\left(\textit{total SCF}\right) = [H_2] \times V_{RCS} \times DCF \times 3.531E{-}05 \times 1.0E{-}03$$

= _____ X _____ X ______ X 3.531E-05 X 1.0E-03 = ______ ft^3

Where:

H_2	=	Hydrogen concentration in cc/kg @ STP *(from Step 4)*
V_{RCS}	=	RCS volume in cc *(from Figure 4)*
DCF	=	Density Correction Factor in g/cc *(from Figure 5)*
3.531E-05	=	Conversion factor *(ft^3/cc)*
1.0E-03	=	Conversion factor *(kg/g)*

TOTAL MEASURED HYDROGEN

Containment Hydrogen + RCS Hydrogen = Total Hydrogen *(SCF)* = __________ SCF

2.45 Form EP-0513, Containment Hydrogen CDA, page 3 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 3 of 5)

DATE:	TIME:	UNIT:	CYCLE:

6) HYDROGEN CORRECTION FOR OXIDATION

The total measured Hydrogen calculated in Step 5 includes Hydrogen generated from the oxidation of materials within Containment, as well as Hydrogen generated from the radiolysis of water. The Hydrogen produced from these two processes will be calculated in Steps 6 and 7 and subtracted from the total Hydrogen calculated in Step 5.

Record the Containment temperature at selected time intervals *(up until the time the Containment sample was obtained)* and calculate the Hydrogen generated by oxidation of materials within Containment using Figure 6.

NOTE: An attempt should be made to select the time intervals such that the change in Containment temperature is not greater than 20°F.

Time at Start of Interval	Interval Duration (hours)	Average Containment Temperature During Interval (°F)	H_2 Production Rate (SCF/hr) from Figure 6	H_2 Produced (SCF) = Interval X Production Rate
Accident Start	--------------	--------------	--------------	--------------

Total Hydrogen Production *(SCF)* ∗ = __________ SCF

∗ The maximum value for PVNGS is 200,271 SCF. If a higher value is obtained from the calculation, enter 200,271 SCF in the space provided.

2.46 Form EP-0513, Containment Hydrogen CDA, page 4 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 4 of 5)

DATE:	TIME:	UNIT:	CYCLE:

7) HYDROGEN CORRECTION FOR RADIOLYSIS

Determine the amount of Hydrogen produced from the radiolysis of water using the following power, decay times, and Figure 7:

Reactor Power at Time of Shutdown *(for constant power conditions)*: ________

Representative Power *(RP)* - *(from Form EP-0512, Step 2)*: ________

Estimated MWT = Full Power MWT X RP = 3800 X ________ = ________ MWT

Reactor Shutdown Date: ________ Reactor Shutdown Time: ________

Sample Date: ________ Sample Time: ________

Time from Shutdown to Sample: ________ hours

Using Figure 7, determine the specific Hydrogen production rate *(SCF/MWT)* by radiolysis for the sample time. Obtain a value from each curve, multiply by the estimated MWT, and record total H_2 produced by radiolysis.

Limit Curve	H_2 Produced *(SCF/MWT)*	Operating Power *(MWT)*	Total H_2 produced *(SCF)*
UPPER:	________ X	________ =	________
LOWER:	________ X	________ =	________

Once obtained, use the results of the radiochemistry damage assessment *(Form EP-0514)* to estimate which results should be used: the Upper Limit for major fuel pellet overheat, the Lower Limit for initial fuel pellet overheat, or the appropriate estimate between the two curves for intermediate fuel overheat.

8) TOTAL HYDROGEN PRODUCED FROM CORE CLAD

Total H_2 Measured *(from Total Measured Hydrogen in Step 5)*: ________ SCF

H_2 Production from Containment Materials *(from Step 6)*: ________ SCF

H_2 Production from Radiolysis *(from Step 7)*: ________ SCF

Total H_2 from Core Clad Oxidation = *(Step 5 - [Step 6 + Step 7])* = ________ SCF

9) PERCENT OF CLAD OXIDIZED

$$\text{\% Clad Oxidized} = \frac{\text{Total } H_2 \text{ from Clad Oxidation}}{5.65E{+}03\ \text{SCF}} = \frac{\_\_\_\_\_\_}{5.65E{+}03} = \_\_\_\_\_\_\ \%$$

2.47 Form EP-0513, Containment Hydrogen CDA, page 5 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 5 of 5)

DATE:	TIME:	UNIT:	CYCLE:

10) PERCENT OF RUPTURED FUEL RODS

Using the percent of clad oxidized *(Step 9)*, the pressure during core uncovering *(Step 2)*, and Figure 8, determine the percent of ruptured fuel rods.

Estimated % Ruptured Fuel Rods *(from Figure 8)*: __________ %

11) PERCENT OF EMBRITTLED FUEL RODS

Using the percent of clad oxidized *(Step 9)* and Figure 9, determine the percent of embrittled fuel rods.

Estimated % Embrittled Fuel Rods *(from Figure 9)*:

RANGE: Upper: __________ % Lower: __________ %

12) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Hydrogen methodology yields damage estimates in Categories 3, 4, 5, 6, or 7.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using the estimates of the percent of fuel rods ruptured, the percent of fuel rods embrittled *(damaged)*, and the Clad Damage Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

USNRC Category*(ies)* of Fuel Damage: __________

13) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

14) COMMENTS

2.48 Form EP-0514, Containment Radiochemistry CDA, page 1 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 1 of 11)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) SAMPLE LOCATIONS

NOTE: During certain small break LOCA events, it will not be possible for PASS to obtain a sample representative of the Containment sump until after a RAS occurs. This could be 14+ hours after the accident. Refer to Core Damage Assessment, Introduction, Noteworthy Items, for guidance without a Containment sump sample.

Determine the most appropriate sample locations for assessment using Figure 10 in Core Damage Assessment.

3) SAMPLING

Obtain radiochemistry samples and sample results from the appropriate sample locations as determined in Step 2, above.

4) SAMPLE DATA

Record the following data at the time each sample was obtained:

	REACTOR COOLANT SYSTEM	CONTAINMENT ATMOSPHERE	CONTAINMENT SUMP
Sample Date			
Sample Time			
Sample Number			
Pressure *(psig)*	--------------		--------------
Temperature *(°F)*			--------------
RCS Level *(RVLMS)* at Sample Time *(%)*		--------------	--------------
Containment Volume *(cc)*	--------------	7.36E+10	--------------
Containment Water Level *(6-150 inches)*	--------------	--------------	

2.49 Form EP-0514, Containment Radiochemistry CDA, page 2 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 2 of 11)

DATE:	TIME:	UNIT:	CYCLE:

5) RCS VOLUME

Determine the RCS volume at the time of the sample using RVLMS and Figure 4 in Core Damage Assessment, or by using ERFDADS Point ID #SPDS0260.

___ HJTC Uncovered = __________ cc *(if using Figure 4 and RVLMS)*

SPDS0260 = __________ gallons X 3.785412E+03 = __________ cc *(if using SPDS0260)*

6) CONTAINMENT WATER VOLUME

NOTE: If Containment water level is not available, Containment water volume must be estimated from RWT, RCS, and SIT volumetric contributions.

Determine the Containment water volume at the time of the sample using Containment water level *(from Step 4)* and Figure 11 in Core Damage Assessment.

Containment Volume = __________ cc

2.50 Form EP-0514, Containment Radiochemistry CDA, page 3 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 3 of 11)

DATE:	TIME:	UNIT:	CYCLE:

7) RCS SAMPLE ACTIVITY CORRECTION

Record the activity of the RCS sample and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

RCS Activity = Decay Corrected Activity *(from above)* X ρ X RCS_{VOL} X 1.0E-06

Where:

ρ = Water density correction factor *(see Figure 5 of Core Damage Assessment)*
RCS_{VOL} = RCS water volume *(from Step 5)*
1.0E-06 = Conversion from µCi to Ci

Record ρ and t: ρ = ____________ t = ____________

Date of Reactor Shutdown: ____________ Date of RCS Sample: ____________
Time of Reactor Shutdown: ____________ Time of RCS Sample: ____________

TABLE 1: RCS SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*RCS Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.51 Form EP-0514, Containment Radiochemistry CDA, page 4 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 4 of 11)

DATE:	TIME:	UNIT:	CYCLE:

8) CONTAINMENT SUMP SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Sump sample if obtained and correct the activity for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*

t = Time since reactor shutdown *(seconds)* at time of sample

Containment Sump Activity = Decay Corrected Activity *(from above)* X Containment Sump Volume X 1.0E-06

Where:

Containment Sump Volume = Containment Sump Volume *(from Step 6)*

1.0E-06 = Conversion from µCi to Ci

Record t: t = ____________

Date of Reactor Shutdown: ____________ Date of Contain. Sump Sample: ____________

Time of Reactor Shutdown: ____________ Time of Contain. Sump Sample: ____________

TABLE 2: CONTAINMENT SUMP SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*Containment Sump Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.52 Form EP-0514, Containment Radiochemistry CDA, page 5 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 5 of 11)

DATE:	TIME:	UNIT:	CYCLE:

9) CONTAINMENT ATMOSPHERE SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Atmosphere sample if obtained and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*

t = Time since reactor shutdown *(seconds)* at time of sample

Containment Atmosphere Activity = Decay Corrected Activity *(from above)* X [(P_1 + 14.7) / 14.7] X [492 / (T_1 + 460)] X (7.36E+10) X 1.0E-06

Where:

P_1 = Containment pressure at time of sample *(psig)*

T_1 = Containment temperature at time of sample *(°F)*

7.36E+10 = Containment atmosphere volume *(cc)*

1.0E-06 = Conversion from µCi to Ci

Record t, P_1, and T_1: t = ________ P_1 = ________ psig T_1 = ________ °F

Date of Reactor Shutdown: ________	Date of Contain. Atmos. Sample: ________
Time of Reactor Shutdown: ________	Time of Contain. Atmos. Sample: ________

TABLE 3: CONTAINMENT ATMOSPHERE SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Specific Sample Activity (µCi/cc)*	*Decay Corrected Specific Activity (µCi/cc)*	*Containment Atmosphere Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.53 Form EP-0514, Containment Radiochemistry CDA, page 6 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 6 of 11)

DATE:	TIME:	UNIT:	CYCLE:

10) IODINE / NOBLE GAS RATIOS

Calculate the following ratios for each Noble Gas and Iodine isotope using the decay corrected specific activities obtained in Steps 7, 8, and 9:

Noble Gas Ratio = Noble Gas Isotope Activity / Xenon ^{133} Activity

Iodine Ratio = Iodine Isotope Activity / Iodine ^{131} Activity

Isotope	*RCS Activity (Ci)*	*RCS Ratio*	*Containment Sump Activity (Ci)*	*Containment Sump Ratio*	*Containment Atmosphere Activity (Ci)*	*Containment Atmosphere Ratio*
Kr^{87}						
Xe^{131m}						
Xe^{133}		1.0		1.0		1.0
I^{131}		1.0		1.0		1.0
I^{132}						
I^{133}						
I^{135}						

11) SOURCE OF RELEASE

Determine the source of release by comparing the ratios calculated in Step 10 *(above)* to the predicted ratios provided below:

Isotope	*Activity Ratio In Fuel Pellet Inventory*	*Activity Ratio In Gap Inventory*
Kr^{87}	0.200	< 0.001
Xe^{131m}	0.003	0.001 - 0.003
I^{132}	1.400	0.010 - 0.050
I^{133}	2.000	0.500 - 1.000
I^{135}	1.800	0.100 - 0.500

NOTE: Within the accuracy of included calculations, it is appropriate to select as a source that ratio which is closest to the value obtained in Step 10.

Source of Release: ______________________

2.54 Form EP-0514, Containment Radiochemistry CDA, page 7 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 7 of 11)

DATE:	TIME:	UNIT:	CYCLE:

12) SOURCE INVENTORY

Each isotope has an equilibrium inventory. However, these equilibrium source inventories must be corrected for the plant power history if the reactor has not been operating continually at 100% power.

The isotopes are divided into 2 groups based on their respective half-lives. Group 1 isotopes are to be used if reactor power has not changed by greater than ± 10% in the last 30 days prior to the accident. Group 2 isotopes are used if reactor power has not changed by greater than ± 10% in the last 4 days prior to the accident.

The following equations can be used to determine the Power Correction Factor *(PCF)* for the respective isotopic group if the previously mentioned criteria is satisfied.

Group 1 PCF = Steady State Power Level for the prior 30 Days / 100

Group 2 PCF = Steady State Power Level for the prior 4 Days / 100

If the reactor has not operated at a constant power level prior to shutdown, the following equation is used *(use a 30-day power history)*:

<u>NOTE</u>: Use only the prior 30-day power history for the equation below.

$$\text{PCF} = {}_j P_j (1 - e^{-t_j}) e^{-t_i}$$

Where:

P_j = Fraction of rated reactor power in period $_j$

t_j = Duration of period $_j$

t_i = Time from the end of period $_j$ to reactor shutdown *(seconds)*

= Decay constant *(seconds $^{-1}$)*

continues...

2.55 Form EP-0514, Containment Radiochemistry CDA, page 8 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 8 of 11)

DATE:	TIME:	UNIT:	CYCLE:

12) SOURCE INVENTORY *continued...*

Using the appropriate equation, calculate the Power Correction Factor for each isotope and the corrected source inventory. Record the results in the tables below.

NOTE: The Equilibrium Source Inventories listed below are the maximum peak inventories for a reactor core operating with 5% enriched U^{235} at 3990 MWT. The actual core inventory will most likely be slightly lower than the inventories given.

GAS GAP INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		1.54E+01	
Xe^{131m}	1	6.7E-07		1.09E+05	
Xe^{133}	1	1.5E-06		1.91E+07	
I^{131}	1	9.9E-07		9.84E+06	
I^{132}	2	8.4E-05		1.14E+04	
I^{133}	2	9.3E-06		1.06E+07	
I^{135}	2	2.9E-05		1.76E+06	

FUEL PELLET INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		7.57E+07	
Xe^{131m}	1	6.7E-07		1.20E+06	
Xe^{133}	1	1.5E-06		2.12E+08	
I^{131}	1	9.9E-07		1.07E+08	
I^{132}	2	8.4E-05		1.55E+08	
I^{133}	2	9.3E-06		2.23E+08	
I^{135}	2	2.9E-05		2.09E+08	
Cs^{134}	1	1.1E-08	1.00	2.22E+07	
Rb^{88}	2	6.5E-04		1.08E+08	
Te^{129}	2	1.7E-04		3.34E+07	
Te^{132}	1	2.5E-06		1.52E+08	
Sr^{89}	1	1.6E-07		1.32E+08	
Ba^{140}	1	6.3E-07		1.98E+08	
La^{140}	1	4.8E-06		2.11E+08	
La^{142}	2	1.2E-04		1.87E+08	
Pr^{144}	2	6.7E-04		1.67E+08	

2.56 Form EP-0514, Containment Radiochemistry CDA, page 9 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 9 of 11)

DATE:	TIME:	UNIT:	CYCLE:

13) INVENTORY PERCENT

Calculate the percent of the corrected source inventory present for each isotope and record the results in the tables below.

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF GAS GAP INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			

continues...

2.57 Form EP-0514, Containment Radiochemistry CDA, page 10 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 10 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***13) INVENTORY PERCENT** continued...*

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF FUEL PELLET INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			
Cs^{134}			
Rb^{88}			
Te^{129}			
Te^{132}			
Sr^{90}			
Ba^{140}			
La^{140}			
La^{142}			
Pr^{144}			

2.58 Form EP-0514, Containment Radiochemistry CDA, page 11 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 11 of 11)

DATE:	TIME:	UNIT:	CYCLE:

14) USNRC CATEGORY OF FUEL DAMAGE

NOTES: Engineering judgment is used to compare the previous parameters with the 10 USNRC Categories of Fuel Damage in Core Damage Assessment, Fuel Damage Categories. Core damage is not anticipated to occur uniformly. It is anticipated that the included calculations will yield a combination of 1 or more categories which exist simultaneously.

Samples are likely to have been collected at different times.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Determine the USNRC Category of Fuel Damage using the Radiological Characteristics from Core Damage Assessment, and the following criteria:

1. Identification of the isotopes which most characterize a given sample *(see Steps 7, 8, and 9)*.
2. Identification of the source of the release *(see Step 11)*.
3. Percent of source inventory for each isotope present *(see Step 13)*.

USNRC Category*(ies)* of Fuel Damage: ____________

15) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

16) COMMENTS

____

____

____

____

____

____

____

____

____

____

____

____

PV216-08NI (8-88)

2.59 Form EP-0541, Palo Verde NAN Emergency Message (sample)

FORM EP-0541 c — **PVNGS EMERGENCY PLANNING**

PALO VERDE NAN EMERGENCY MESSAGE FORM

① *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

② This NAN call was initiated at: ________________ *(time)*

③ This is Palo Verde Nuclear Generating Station Notification of

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY
ALERT GENERAL EMERGENCY

declared in Unit ____ at ________ *(time)* on ____________ *(date)*.

PVNGS Emergency Status Code*(s)* ________________

④ The wind speed is ________ *(35' elev - 15 min avg)* MPH from ________ *(35' elev - 15 min avg)* Degrees

Authenticator Code: ________________

This is ________________ *(name)* : STSC Comm Gov't Liaison *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF *(Circle ERO facility)*

⑤ THERE IS *(circle one)* A Radioactive Release . NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ________
- ☐ Other ________________

⑥ *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

________________ *(EC / EOD Signature)*

________________ *(Date)* *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-256-1010]			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-223-2000]			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-255-4845]			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-244-0500]			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-273-1411]			
USNRC Headquarters *(STA will call)*	[301-816-5100]	[301-951-0550]			
⑦ **GROUP PAGER:** *(Read Message)*: "This Is / Is not a drill. This is PVNGS Unit ____ Classification ________ Please respond appropriately." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager [1611])*	Normal phone *(pager [7600-1611])*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager [1677])*	Normal phone *(pager [7600-1677])*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager [1633])*	Normal phone *(pager [7600-1633])*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	[81-1080] [81-1081] or [9-602-250-1070]			

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2.60 Form EP-0542, Followup Emergency Message, page 1 of 2 (sample)

FORM EP-0542A **PVNGS EMERGENCY PLANNING**

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 1 of 2)*

1 *(check one)* ☐ - THIS IS A DRILL ☐ - THIS IS NOT A DRILL

Message Number: ____________________
(ARRA use only)

THIS IS A PALO VERDE NUCLEAR GENERATING STATION FOLLOW-UP INFORMATION MESSAGE CONCERNING THE *(circle one)*
UNUSUAL EVENT - ALERT - SITE AREA EMERGENCY - GENERAL EMERGENCY declared in Unit ____ at __________ MST on __________
(time) *(date)*

PVNGS EMERGENCY STATUS CODE*(S)* for Emergency stated above __________

2 THIS IS ______________________________ at ______________________
(name) *(ERO title)* *(facility)*

3 EMERGENCY stated above was *(check one)*

☐ - UPGRADED to ______________ at __________ MST on __________
☐ - CONTINUES
☐ - DOWNGRADED to ______________ at __________ MST on __________
☐ - TERMINATED at ______________________ MST on __________

4 PROTECTIVE ACTION RECOMMENDATION(S) *(check appropriately)*

☐ - NONE
☐ - NO CHANGE SINCE LAST PAR
☐ - EVACUATE ______________________________
☐ - SHELTER ______________________________
☐ - OTHER ______________________________

If the Emergency was terminated, go to Item 14 after completing Items 1-4 (otherwise, continue to Item 5).
If Items 5-13 have not changed from previous Follow-up transmission, write "NC" by those that apply.

5 EMERGENCY DESCRIPTION / REMARKS

____
____
____
____

6 PVNGS FIELD ACTIVITIES

☐ - RFAT dispatched
☐ - Site Evacuation

7 REACTOR STATUS *(check one)*

☐ - Tripped at __________ MST
on __________
☐ - Critical at ____ % thermal power
☐ - Shutdown in progress

PV216-08M (8-88)

2.61 Form EP-0542, Followup Emergency Message, page 2 of 2 (sample)

FORM EP-0542A **PVNGS EMERGENCY PLANNING**

FOLLOW-UP EMERGENCY MESSAGE FORM (part 2 of 2)

8 GASEOUS RELEASES *(check one)*

Message Number: ____________ *(ARRA use only)*

☐ - Within Technical Specifications ☐ - Were above Technical Specifications
☐ - Above Technical Specifications ☐ - Potentially above Technical Specifications

Point of Release ____________ Estimated Duration ____________ Started at ________ MST on ________
Last Significant Change at ________ MST on ________ Release stopped at ________ MST on ________
Iodines ________ μCi/sec Noble Gases ________ μCi/sec Iodine / Noble Gas ________ *(ARRA use only)*
Effluent flow rate ______ cfm x 472 = ____________ cc/sec *(ARRA use only)*

9 METEOROLOGICAL DATA

Wind is from ________ *(35' elev - 15-min avg)* Degrees at ________ *(35" elev - 15-min avg)* MPH Stability Class ________ Precipitation *(circle one)* YES NO

10 PLUME ARRIVAL TIME AT *(enter time or "N/A" if not applicable)*

Ruth Fisher School ________ MST Arlington School ________ MST

11 THE FOLLOWING ACTIONS ARE UNDERWAY ____________

12 WE REQUEST THE FOLLOWING ONSITE SUPPORT / ASSISTANCE FROM OFFSITE SOURCES

____

13 OUR PROGNOSIS IS that conditions
☐ - Are under control
☐ - Can be expected to terminate within ______ hours
☐ - Are worsening

14 *(check one)*
☐ - THIS IS A DRILL
☐ - THIS IS NOT A DRILL

APPROVAL:

____
Emergency Coordinator (EC)
-- or --
Emergency Operations Director (EOD)

____
Date *Time*

2.62 Form EP-0543, Emergency Termination Message (sample)

FORM EP-0543 D **PVNGS EMERGENCY PLANNING**

EMERGENCY TERMINATION MESSAGE FORM

① *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

② This NAN call was initiated at: ____________ *(time)*

③ This is Palo Verde Nuclear Generating Station. The...

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY

ALERT GENERAL EMERGENCY

declared in Unit ____ at ________ *(time)* on ____________ *(date)*

has been terminated at ________ *(time)* on ____________ *(date)*

④ The wind speed is ________ *(35' elev - 15 min avg)* MPH from ________ *(35' elev - 15 min avg)* Degrees

Authenticator Code: ______________

This is ______________ *(name)*: STSC Comm Gov't Liaison *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF *(Circle ERO facility)*

⑤ THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ________
- ☐ Other ______________

⑥ *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

______________ *(EC / EOD Signature)*

______________ *(Date)* *(Time)*

RESPONDING AGENCY	PRIMARY LINK	ALTERNATE LINK	EMERGENCY NOTIFICATIONS		
			Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-256-1011]			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-223-2000]			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-255-4845]			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-244-0504]			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-273-1411]			
USNRC Headquarters *(STA will call)*	[301-816-5100]	[301-951-0550]			
⑦ GROUP PAGER: *(Read Message)*: "This Is / Is not a drill. This is PVNGS - the event has been terminated." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager [1611])*	Normal phone *(pager [7600-1611])*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager [1677])*	Normal phone *(pager [7600-1677])*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager [1633])*	Normal phone *(pager [7600-1633])*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	[81-1080] [81-1081] or [9-602-250-1070]			

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2.63 Form EP-0560, Site Security Status (sample)

FORM EP-0560A — PVNGS EMERGENCY PLANNING

SITE SECURITY STATUS

Name:		Date:	Time:
ACCESS CONTROL			
Site		**Protected Area**	
Vehicle Traffic:		Personnel Traffic:	
Areas to Avoid:		Areas to Avoid:	
IMPACTS TO SECURITY			

OFFSITE ASSISTANCE		
Notified	**E T A**	**Onsite**

TECHNICAL SUPPORT CENTER SECURITY
MISCELLANEOUS
Suspension of Safeguards:
Unaccounted Individuals:
Transportation:
Security Personnel Status:

2.64 Form EP-0561, Individual Accountability (sample)

FORM EP-0561 B **PVNGS EMERGENCY PLANNING**

INDIVIDUAL ACCOUNTABILITY

Assembly Area:		Date:	Time:
Department / Group:			Unit:
NAME	***ACAD NUMBER***	***NAME***	***ACAD NUMBER***
NOTE: Contact Security Supervision or FAX this completed form with Accountability results for this Assembly Area to the CAS			

2.65 Form EP-0570, RMS Overview, page 1 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 1 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-01	CH-1	Particulate	µCi / cc	Containment airborne - Isolates on SIAS / CIAS - Required for leak detection - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
	CH-3	Noble Gas	µCi / cc	Required for leak detection - Indicates actual concentration
RU-02	CH-1	Liquid	µCi / ml	Train-A Essential Cooling Water monitor
RU-03	CH-1	Liquid	µCi / ml	Train-B Essential Cooling Water monitor
RU-04	CH-1	Liquid	µCi / ml	S/G-1 blowdown monitor
RU-05	CH-1	Liquid	µCi / ml	S/G-2 blowdown monitor
RU-06	CH-1	Liquid	µCi / ml	Nuclear Cooling Water monitor
RU-07	CH-1	Liquid	µCi / ml	Auxiliary Steam Condensate monitor - HI Alarm diverts condensate to radwaste storage
RU-08	CH-1	Particulate	µCi / cc	Auxiliary Building airborne - Located downstream of RU-09 and RU-10 - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
RU-09	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 100' elevation and below
RU-10	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 120' elevation and above
RU-12	CH-1	Noble Gas	µCi / cc	Waste Gas Decay Tank release monitor - HI Alarm isolates WGDT release
RU-14	CH-1	Particulate	µCi / cc	Radwaste Building Exhaust - Indicates rate-of-change in accumulated activity
RU-15	CH-1	Noble Gas	µCi / cc	Radwaste Building Exhaust
RU-16	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation personnel hatch
RU-17	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation seal table area - Disconnected under power operation
RU-18	CH-1	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-19	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation - monitors new fuel racks
RU-20	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-21	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-22	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-23	CH-1	Radiation	mrem / hr	Chemistry Laboratory 140' elevation general area
RU-24	CH-1	Radiation	mrem / hr	Central Calibration Facility north of Unit 1
RU-25	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation controlled machine shop
RU-26	CH-1	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area
RU-29	CH-1	Noble Gas	µCi / cc	Train-A Control Room Ventilation Intake monitor - HI Alarm initiates CREFAS
RU-30	CH-1	Noble Gas	µCi / cc	Train-B Control Room Ventilation Intake monitor - HI Alarm initiates CREFAS
RU-31	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation Fuel Pool general area - HI Alarm initiates Train-A FBEVAS which cross-trips CREFAS
RU-33	CH-1	Radiation	mrem / hr	Containment 140' elevation refueling machine general area - Disconnected under power operation
RU-34	CH-1	Noble Gas	µCi / cc	Containment Purge release monitor
RU-37	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-A CPIAS which cross-trips CREFAS
RU-38	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-B CPIAS which cross-trips CREFAS

2.66 Form EP-0570, RMS Overview, page 2 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 2 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-5x	CH-1	Particulate	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
(51 / 52 / 53)	CH-2	Iodine	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
	CH-3	Noble Gas	µCi / cc	Not normally used
RU-61	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 1 Plant Vent stack
RU-62	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 2 Plant Vent stack
RU-63	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 3 Plant Vent stack
RU-139	CH-1	Radiation	mrem / hr	S/G-1 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-1 Main Steam Line-2 monitor
RU-140	CH-1	Radiation	mrem / hr	S/G-2 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-2 Main Steam Line-2 monitor
RU-141	CH-1	Noble Gas	µCi / cc	Condenser Vacuum Exhaust monitor - HI Alarm lines up condenser exhaust in Thru-Filter Mode
RU-142	CH-1	N^{16}	cpm	S/G-1 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-2	N^{16}	cpm	S/G-1 Main Steam Line-2 monitor for S/G tube leakage at power
	CH-3	N^{16}	cpm	S/G-2 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-4	N^{16}	cpm	S/G-2 Main Steam Line-2 monitor for S/G tube leakage at power
RU-143	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent LO-Range monitor - actual concentration
	CH-2	Particulate	µCi / cc	Auxiliary Building Vent LO-Range monitor - indicates gross activity only
	CH-3	Iodine	µCi / cc	
RU-144	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Auxiliary Building Vent HI-Range monitor
	CH-3	Rel Humidity	% RH	
	CH-4			Non-existent - Used as filter collection chambers
	CH-5			
RU-145	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust monitor - HI Alarm initiates Train-B FBEVAS which cross-trips CREFAS
RU-146	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Fuel Building Exhaust HI-Range monitor
	CH-3			Non-existent - Used as filter collection chambers
	CH-4			
	CH-5			
RU-148	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation seal table area
RU-149	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation personnel hatch
RU-150	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-A monitor at 80' elevation
RU-151	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-B monitor at 80' elevation
RU-152	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 70' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 70' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west end 40' elevation near RDT Pumps
	CH-4	Radiation	mrem / hr	Auxiliary Building center wall 51' elevation at Containment
RU-153	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 100' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Charging Pumps
	CH-3	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Penetration Room

2.67 Form EP-0570, RMS Overview, page 3 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 3 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-154	CH-1	Radiation	mrem / hr	Auxiliary Building west end 120' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east end 120' elevation by RU-10 monitor
	CH-3	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-155	CH-1	Radiation	mrem / hr	MSSS 86' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 86' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 88' elevation
	CH-4	Radiation	mrem / hr	Auxiliary Building 120' elevation *(Letdown monitor)*
RU-156	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 70' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
RU-157	CH-1	Radiation	mrem / hr	MSSS 100' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 100' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 120' elevation
RU-158	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 120' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building 140' elevation at Containment personnel hatch
	CH-3	Radiation	mrem / hr	Auxiliary Building east penetration 140' elevation by purge lines
	CH-4	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area

2.68 Form EP-0620, Technical Analysis Overview (sample)

FORM EP-0620 A **PVNGS EMERGENCY PLANNING**

TECHNICAL ANALYSIS OVERVIEW

DATE:	TIME:
CRITICAL SAFETY FUNCTION STATUS	
Reactivity Control:	
Inventory Control:	
Pressure Control:	
Heat Removal:	
Maintenance of Vital AC:	
Maintenance of Vital DC:	
Containment Isolation:	
Containment Combustible Gas Control:	
Containment Temperature / Pressure Control:	
LOST SAFETY FUNCTION	
Time to boil:	
Time to uncover core:	
Time to core melt:	
Time to Rx vessel failure:	
Time to Containment failure:	
Time to reach 65 psig Containment:	

DOSE PROJECTIONS *(SA)* - HIGH SIDE		**RECOMMENDATION TO REDUCE OFFSITE DOSE CONSEQUENCES**
2 -Hour EAB *(Thyroid CDE)*:	REM	
2 -Hour EAB *(TEDE)*:	REM	
__-Hour EAB *(Thyroid CDE)*:	REM	
__-Hour EAB *(TEDE)*:	REM	
__-Hour LPZ *(Thyroid CDE)*:	REM	
__-Hour LPZ *(TEDE)*:	REM	

RECOMMENDED OPERATOR ACTION*(S)*
OTHER INFORMATION

2.69 Form EP-0630, Engineering Summary (sample)

FORM EP-0630A **PVNGS EMERGENCY PLANNING**

ENGINEERING SUMMARY

DATE:	TIME:
CRITICAL SAFETY FUNCTION STATUS	
Reactivity Control:	Inventory Control:
Pressure Control:	Heat Removal:
Maintenance of Vital AC:	Maintenance of Vital DC:
CTMT Isolation:	CTMT Combustible Gas Control:
CTMT Temperature / Pressure Control:	
LOST SAFETY FUNCTION	
Time to boil:	*Time to uncover core:*
Time to core melt:	*Time to Rx vessel failure:*
Time to CTMT failure:	*Time to reach 65 psig CTMT:*

EQUIPMENT OUT OF SERVICE	***FAILURE MODE***	***ESTIMATED RECOVERY TIME***

SYSTEMS STATUS
Heat Sink Systems:
Chemistry:
Electrical:
Mechanical:
Reactor Engineering:
Safety / Risk Assessment:

RESOURCE RECOMMENDATION*(S)*	
Equipment	**Personnel**

CONTINGENCIES

OTHER INFORMATION

Appendix D - Notification

1.0 Initial notifications

1.1 Noteworthy Items for notifications

1.1.1 The numbers on the colored Authenticator Code envelopes represent the sequence of actual events that have taken place on site during the current calendar year. They do not represent the month of the year. The white Authenticator Code envelopes are used for drills, exercises, and tests only. Use the same Authenticator Code for the entire event. However, if the event terminates after offsite agencies have been notified and then another event takes place, retrieve the next lowest-numbered colored Authenticator Code envelope.

1.1.2 If the event has been terminated prior to commencing notifications, the Emergency Termination Message Form should be used in place of the Palo Verde NAN Emergency Message Form. If the event or Protective Action Recommendation changes during notifications, inform the current contact that the event has changed and discontinue calling the remaining people on the call-out list.

1.1.3 Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, meteorological information required on any of the forms should be entered as "N/A". Ensure that the Emergency Coordinator / Emergency Operations Director is informed and that someone is sent to the Meteorological Tower for the necessary data to provide to the offsite agencies at a later time.

1.1.4 While making upgraded, downgraded, and/or termination notifications, complete the "Date / Time / Initials" columns for those agencies contacted. Certain agencies may not respond on backshifts or weekends. The individual notifying USNRC Headquarters will complete the "USNRC Headquarters" Section of the form.

1.1.5 If contact with the required agencies is not made via the NAN ringdown phones, either the NAN Radio Backup (PVNGS radio), the regular phone, or the cellular telephone must be used. The designated backup for the NAN is the PVNGS radio.

1.1.6 The Group Pager message that is read to Emergency Response Organization personnel should include the emergency classification by name, e.g., Unusual Event, Alert, etc.

1.1.7 All noteworthy items and problems should be recorded on the Action Logsheets.

1.2 Authenticator Codes

1.2.1 For initial notification of the current event, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope. Do not complete step 2 of the form at this time.

1.3 Completing the Emergency Message Form

1.3.1 Complete Steps 1, 4, and 6 of Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

1.3.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

1.4 Checking whether NAN is operational

1.4.1 If the NAN is operational, notify offsite agencies using step 1.5. If the NAN is not operational, notify offsite agencies using step 1.6.

1.5 Offsite notifications using the NAN

1.5.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

1.5.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.5.3 Repeat message once.

1.5.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.5.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.5.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

1.5.7 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.5.8 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

1.5.9 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.5.10 Go to step 1.7 to perform Group Pager notifications.

1.6 Offsite notifications using the NAN Backup

1.6.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

1.6.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

1.6.3 Press the "Mode" button until the display indicates "GOVT AGENCY". The display will alternate between "GOVT AGENCY" and "ID - 710100". [handheld radio - enter "710100" on the keypad]

1.6.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

1.6.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

1.6.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

1.6.7 Record the time in Step 2 of the form.

1.6.8 Key the radio microphone and announce the following message: "ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.6.9 After a 30-second waiting period, repeat the preceding message.

1.6.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.6.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.6.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.6.13 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

1.6.14 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.6.15 Go to step 1.7 to perform Group Pager notifications.

1.7 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

1.7.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

1.7.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

1.7.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

1.7.4 If this offsite notification is the initial notification for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

2.0 Followup agency notifications

As directed, perform the actions associated with followup offsite agency notifications.

NOTE

Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), is to be completed after the initial notifications have been made and as soon as time permits. It should be prepared when information becomes available and transmitted to the Arizona Radiation Regulatory Agency when requested. It does not have to be completed if classification and termination were made with the same notification.

2.1 Complete the Follow-up Emergency Message Form

2.1.1 Complete Steps 1 and 14 from Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms). Complete Step 2.

2.1.2 Instruct the Radiation Protection Monitor / Radiological Assessment Coordinator to complete Steps 8, 9, and 10 of the form.

2.1.3 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 through 7 and 11 through 14 of the form, review the form for accuracy, and sign the form.

2.2 Fax the Follow-up Emergency Message Form

2.2.1 When the Follow-up Emergency Message Form has been requested by the Arizona Radiation Regulatory Agency, get the facsimile (FAX) telephone number to where it should be transmitted. Per the Emergency Coordinator's / Emergency Operations Director's instructions, transmit Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), to the Arizona Radiation Regulatory Agency via fax. When complete, inform the Emergency Coordinator / Emergency Operations Director that the Follow-up Emergency Message Form has been transmitted to the Arizona Radiation Regulatory Agency.

3.0 Emergency termination notifications

As directed, perform the actions associated with offsite agency emergency termination notifications.

NOTE

Notifications to State/County agencies per the Emergency Termination Message Form shall commence within 15 minutes following termination of the emergency declaration.

3.1 Authenticator codes

3.1.1 For initial notification and termination only, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope.

3.2 Completing the Emergency Termination Message Form

3.2.1 Complete Steps 1, 4, and 6 of EP-0543, Emergency Termination Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

3.2.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

3.3 Checking whether NAN is operational

If the NAN is operational, notify offsite agencies using step 3.4. If the NAN is not operational, notify offsite agencies using step 3.5.

3.4 Offsite notifications using the NAN

3.4.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

3.4.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.4.3 Repeat message once.

3.4.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.4.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.4.6 Announce the following message:."STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.4.7 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

3.4.8 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.4.9 Go to step 3.6 for Group Pager notification.

3.5 Offsite notfications using the NAN Backup

3.5.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

3.5.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

3.5.3 Press the "Mode" button until the display indicates "GOVT AGENCY". (The display will alternate between "GOVT AGENCY" and "ID - 710100".) [handheld radio - enter "710100" on the keypad]

3.5.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

3.5.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

3.5.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

3.5.7 Record the time in Step 2 of the form.

3.5.8 Key the radio microphone and announce the following message:"ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.5.9 After a 30-second waiting period, repeat the preceding message.

3.5.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.5.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.5.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

3.5.13 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.5.14 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

3.5.15 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.5.16 Go to step 3.6 for Group Pager notification.

3.6 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

3.6.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

3.6.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

3.6.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

3.6.4 If this offsite notification is the initial notification and termination for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

Appendix E - ERDS Activation

1.0 For an Alert or higher Emergency Classification, activate the Emergency Response Data System in accordance with the following instructions.

1.1 10 CFR 50.72 states: "The licensee shall activate the Emergency Response Data System (ERDS) as soon as possible, but not later than one hour, after declaring an emergency class of alert, site area emergency, or general emergency. The ERDS may also be activated by the licensee during emergency drills or exercises if the licensee's computer system has the capability to transmit the exercise data." At PVNGS, ERFDADS sends information via ERDS to the USNRC at both the Regional Office and Headquarters on the Federal Telecommunications System (FTS) telephone lines through three dial-up modems (one per Unit). ERDS in all three Units can be active simultaneously.

1.2 If ERFDADS is not functioning, perform the following actions:

1.2.1 Inform the Emergency Coordinator that ERDS cannot be activated.

1.2.2 Notify the USNRC via the FTS-2000 (ENS) telephone and report that ERDS cannot be activated.

1.3 If the current Unit number shown in the top left corner of the display must be changed to transmit data for the applicable Unit, perform the following actions:

1.3.1 With the left mouse button, click on "Top Menu" at the lower left corner of the display.

1.3.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.3.3 When the System Functions Menu - 1 of 2 display appears, click on the "Unit/Server Switch" box.

1.3.4 When the Unit/Server Switch display appears, highlight the desired Unit.

1.3.5 When highlighted, click on the "Apply" button at the top of the display.

1.3.6 The display should read "Unit switched -- PROCEED."

1.3.7 Click on the "OK" button in the box.

1.4 Log into the system.

NOTE

Failing to activate ERDS within 15 minutes following logon will result in automatic logoff and the logon process must be reinitialized prior to ERDS activation.

1.4.1 With the left mouse button, click on "Options" toward the left end of the top menu bar.

1.4.2 When the "Options" pull-down menu appears, click on "Logon".

1.4.3 When the "R*TIME/X Password Entry" box appears, click on the empty rectangle box to place the flashing cursor in the box.

1.4.4 Type STA and click on the "Apply" button in the "R*TIME/X Password Entry" box.

1.4.5 The "Password Entry" box should disappear and logon is complete.

1.5 Activate ERDS.

1.5.1 Following logon into the system, click on "Top Menu" at the lower left corner of the display.

1.5.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.5.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.5.4 When the ERDS Communication Link display appears, highlight the "Activate" box.

1.5.5 When highlighted, click on the "Apply" button at the top of the display.

1.5.6 The "Activate" highlight should disappear and ERDS is activated.

1.6 ERDS status may be monitored as follows.

1.6.1 To display the status of the ERDS communication link, click on "Top Menu" at the lower left corner of the display.

1.6.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.6.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.6.4 When the ERDS Communication Link display appears, ensure that the information displayed indicates appropriate communications status and proper transmission of data.

1.7 Deactivate ERDS upon event termination. ERDS deactivation requires current system logon.

1.7.1 If system logon is required, use step 1.4.

1.7.2 Following system logon, click on "Top Menu" at the lower left corner of the display.

1.7.3 When the Top Menu display appears, click on the "System Function Displays" box.

1.7.4 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.7.5 When the ERDS Communication Link display appears, highlight the "Terminate" box.

1.7.6 When highlighted, click on the "Apply" button at the top of the display.

1.7.7 The "Terminate" highlight should disappear and ERDS is deactivated.

1.8 See Appendix O - ERFDADS operation for a list of data that is transmitted on ERDS.

Appendix F - Dose Projection

1.0 Noteworthy items

1.1 The MESOREM-JR computerized dose assessment program is the primary dose calculation method used for performing dose projections. If the primary method cannot be used at the preferred location, it should be performed at an alternate location and the dose projection results telecommunicated to the preferred location.

1.2 Printers shall not be connected to uninterruptible power supplies dedicated as backup power sources to computers designated for dose projection capability. If a computerized dose projection must be performed using an uninterruptible power supply as the sole power source, calculation results must be transcribed manually from the computer monitor display.

1.3 The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

1.4 The 1% failed fuel scenario should be selected unless plant conditions indicate severe (>10%) fuel clad failure.

1.5 Use of 100% fuel clad failure will project extreme levels of Iodine activity. If this scenario is used, Survey Teams must be made aware of the potential for extreme levels of Iodine activity and of the need to expedite data verification surveys. Since calculated doses are analytic estimates only, the calculations should be validated with field data as soon as possible. If calculated estimates differ considerably from associated field data, Emergency Operations Facility staff should use the "Back-Calculation" function to obtain an adjusted projection and the function should be repeated until a best-fit calculation correlates with the associated field data.

1.6 If the "F1 - Isolated Containment" option is selected from the Accident Menu, the Dose Projection Technical Basis Manual may be referenced for information pertinent to this accident scenario. Accordingly, correlation monitor values for Containment RMS Monitors RU-148 / RU-149 are also provided in the manual for instances when these monitors are inoperable or are not functioning properly.

1.7 Parameter entries must be in accordance with the options given for each, i.e., within a specified range, entered in a specific format, etc. Review each option. In cases where the actual value is less than the lowest range, or greater than the highest range value, enter the minimym or maximum allowable range value. Make a note of the actual value on page 4 of the printout.

1.8 If one projection is continued through a date change, and actual date on a menu screen will not be updated until that screen is exited and then re-entered on the new date. This will not affect the program results.

1.9 If RMS Monitors RU-139/140 are inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release. These default values, based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, will result in the issuance of very conservative Protective Action Recommendations. The Emergency Coordinator or Emergency Operations Director must be informed that values obtained are based on the assumption of 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release. A Survey Team must be dispatched immediately to the Site Boundary to verify the release levels.

1.10 RMS Monitors RU-139 / RU-140 will respond to N16 gamma during steam generator tube leakage at power operation in addition to designed activity monitoring. Use of at-power RU-139 / RU-140 monitor values could result in an extremely conservative dose projection. In this case, it is imperative to obtain a sample and repeat the dose calculation immediately after reactor scram.

1.11 During steam releases from specific plant systems, the possibility exists of the systems to achieve a solid condition. In these instances, any release would most likely become entrained with liquid. If this condition coincides with major steam generator tube failures, the projected Thyroid CDE value should be multiplied by a factor of 100.

1.12 The "F7 - Waste Gas Decay Tank Accident" selection on the Accident Menu is not appropriate for a surge tank or any tank / pathway gaseous release which may contain significant Iodine activity. The "F4 - Loss of Coolant Accident 1%" projection should be selected for any release containing potential Iodine activity (i.e., tank isolated for less than 45 days).

1.13 Unmonitored Release

Typical accident assumptions would indicate that a release is occurring which is not monitored by an RMS monitor, nor would there be any flow rate(s) available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release are a ruptured tank in the Radwaste yard which contained radioactive liquids; an outside fire involving radioactive waste, an accident involving waste shipment on site, an accident in the Radwaste Storage Building, etc. In all of these cases, release rates would typically be relatively low, but the potential would exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a MESOREM projection until actual Site Boundary data becomes available.

1.14 For unmonitored release events, the Survey Teams should be directed to obtain peak dose rate readings at the leading edge of the plume based on the current plume direction. The team(s) should be prepared to follow the leading edge as necessary. They should report current dose rates (closed window) which may be used as External EDE dose rates measured per hour for PAR determinations. The External EDE dose rates should be used, along with the current ERFDADS wind speed, to determine when the leading edge of the plume will reach the Site Boundary and what the dose rates will be at the time of arrival. Decay need not be taken into effect at this time. If Iodine shows any significance, the External EDE dose rate should be multiplied by 2. The net dose determined should be treated as TEDE for PAR purposes and Appendix B - Protective Action Recommendations, should be reviewed using this value to derive a qualified Protective Action Recommendation for the EC / EOD. In most cases, these actions will demonstrate Site Boundary dose to be minimal or zero, due to the low release rate. The team(s) should be instructed to obtain as many air samples as practicable to provide data for follow-up analyses. Appendix R - Dose Projection Technical Bases, provides additional methodologies and information which may be of use in several types of unmonitored scenarios.

2.0 MESOREM, Jr. startup

2.1 Select "MESOREM" from the functional display or select the MESOREM icon.

2.2 At the "PASSWORD" Prompt, type one of the following:

- STSC (for units inside the Protected Area)
- EOF (for the unit in the EOF and for program copies downloaded from the LAN)

2.3 At the "ID" Prompt, type 000000 (six zeroes).

2.4 Review the "Help" item that follows. Press <ENTER> when completed.

2.5 When the "Command Menu" appears, ensure that the "Current Time" field is correct toward the upper right portion of the display. If the time and/or date requires adjustment, select Q to quit and adjust the time and/or date accordingly. When complete, execute the previous steps to this point.

2.6 Re-evaluate the current time and date for accuracy.

2.7 Select <F2> ("Execute Dispersion Model").

NOTE

Selection <F2> ("Execute from Edited Files") on the "Mode-A Menu" display is employed only by Emergency Operations Facility personnel. Further guidance on this function may be obtained from the Dose Projection Technical Bases Manual.

2.8 When the "Mode-A Menu" display appears, select <F1> ("Fast Mode A - Initiate Model from Sequential Screens").

2.9 When the "Accident Menu" display appears, proceed to Section 3.0 of this document.

3.0 MESOREM, Jr. Mode A dose projection

3.1 When the "Accident Menu" appears as represented below, select the appropriate accident type:

3.1.1 F1 - Isolated Containment

3.1.2 F2 - Steam Generator Tube Rupture 1%

3.1.3 F3 - Steam Generator Tube Rupture 100%

3.1.4 F4 - Loss of Coolant Accident 1%

3.1.5 F5 - Loss of Coolant Accident 100%

3.1.6 F6 - Fuel Handling Accident

3.1.7 F7 - Waste Gas Decay Tank Accident

3.2 For the following prompts, enter the appropriate data as indicated:

3.2.1 Time Emergency Declared - enter the time the emergency was declared, as this entry will affect the plume mixing height. For back-calculations, enter the time the original event / release occurred.

3.2.2 Date Emergency Declared - enter the current date. For back-calculations, enter the appropriate date the original calculation was performed.

3.2.3 Adverse Weather or Normal Weather - enter Normal. Enter Adverse when weather / road conditions will delay evacuation times.

3.2.4 Expected Total Release Duration Time - if known, enter the expected duration of the release. If unknown, enter 2 hours initially. If release phase extends beyond 2 hours, enter values high enough to encompass total release phase time.

3.2.5 Has Release Been in Progress - enter Yes. Entering No will invoke the "Time Until Release Begins" Prompt, which allows for a bounding calculation based on degrading conditions and the release projected to begin in the future.

NOTE

The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

3.2.6 Time Release Has Been in Progress - enter the difference between the current time and the time the release began. Ensure that the time entered is less than the time entered for the "Expected Total Release Duration".

3.2.7 Has Reactor Been Scrammed - enter Yes if the source mix is decaying and is not directly attributable to a critical reactor.

3.2.8 Number of Hours and Minutes Since Scram - enter the difference between the current time and the time the source mix began to decay.

3.2.9 When the "Monitor Type Menu" appears, select the appropriate RMS Monitor for the applicable release path.

NOTE

Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, get weather information by dialing the National Weather Service in Phoenix (602-379-4609) or (602-379-4611) and requesting current meteorological data at PVNGS.

3.2.10 Wind Speed - enter the 15-minute average of the 35-foot elevation wind speed parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 1 mph.)

3.2.11 Wind Direction - enter the 15-minute average of the 35-foot elevation wind direction parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 90º.)

NOTE

The default Delta-T used by the program is +18ºF, which is extremely stable, thus very conservative. Therefore, if ERFDADS meteorological data is unavailable and data has been obtained from the National Weather Service, a more appropriate Stability Class can be derived by selecting a Delta-T from the Alternative Delta-T Chart, as the National Weather Service is not able to provide Delta-T at PVNGS. The Stability Class will display after the Delta-T has been entered.

3.2.12 Delta-T - enter the 15-minute average Delta-T obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 18). If data has been obtained from the National Weather Service, select an appropriate Delta-T using the following Alternative Delta-T Table to derive an appropriate Stability Class

Alternative Delta T		
Wind Speed, mph	Day (light)	Night (dark)
< 4	- 1.6° F	+ 4.0 ° F
4 - 7	- 1.4° F	+ 2.0° F
> 7 - 9	- 1.4° F	+ 1.0° F
> 9 - 13	- 1.0° F	- 1.0° F
> 13	- 1.0° F	- 1.0° F

3.2.13 The calculated mixing depth, presented in units of meters, will display after the Ambient Temperature is entered. The mixing depth correlates to the height at which the plume stops rising and levels out.

3.2.14 Ambient Temperature - enter the 15-minute average Ambient Temperature obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 62.)

3.3 Press <ENTER>.

NOTE

Selection <F1> ("Grab Sample Analysis Complete") on the "Breakdown Menu" display is employed only by Emergency Operations Facility personnel. Use of this function is addressed in the Dose Projection Technical Bases Manual. Selection <F2> ("Grab Sample Analysis Incomplete") assumes a default isotopic mix, with the projection based on RMS Monitor values and process flow rate.

3.4 When the "Breakdown Menu" appears, select <F2> ("Grab Sample Analysis Incomplete").

NOTE

Filter efficiencies for both the Plant Vent and Fuel Building Exhaust are assumed to be 95% when in operation and lined up through filtration. Prior to data entry, the associated system status must be verified. If status cannot be verified or the system associated with the applicable release point is not in operation and lined up through filtration, then filter efficiency is assumed to be 0%. All other release points are assumed to be 0% efficient. RU-148 / RU-149 values obtained from other sources may need to be converted to REM / hour for input into the system.

3.5 At the prompts requiring RMS Monitor data, process flow rate, and filter efficiency, enter the data associated with the applicable release point.

3.6 At the "Do you wish to revise effluent data again?" Prompt, enter Y if a review / correction of data is required or N to continue.

3.7 At the "Would you like an automatic dump to the printer" Prompt, enter Y to perform / print the calculation or N to review / transcribe the calculation results from the computer monitor display.

3.8 When the prompt "Will this be a simultaneous release?" appears, select the most appropriate response based on the following option summary:

3.8.1 Y - returns to the "Accident Menu" to allow for performance of a second projection using the same meteorological data to obtain summed doses. If this option is selected, the dose projection starting with step 2.0 must be performed a second time, after which the prompt "Do you wish to consider other release points?" will display. Select N after all release calculations have been performed. A summation dose report entitled "Simultaneous" will then be spooled to the printer.

3.8.2 N - invokes the "Receptor Display Menu", offering additional options for detailed reviews of the data. (These are generally employed by the Radiological Assessment Coordinator in the Emergency Operations Facility using the Dose Projection Technical Bases Manual).

3.9 When the "Receptor Display Menu" appears, select Q, which invokes the prompt "Do you wish to perform another forecast? [Y/N]." If another projection is required, enter Y and perform another projection from the "Accident Menu" starting with step 2.0. Enter N to continue with the existing projection from the "Command Menu" selections.

3.10 Transfer the printed report to the Radiation Protection Monitor in the Affected Unit STSC or to the Radiological Assessment Coordinator in the EOF as soon as possible. Additional copies of the printed report may be produced and distributed as required.

4.0 MESOREM, Jr. availability

4.1 MESOREM-JR is currently available in each Unit and in the EOF. The EOF MESOREM-JR computers are equipped with uninterruptible power supplies. Additionally, each location has MESOREM-JR available on a backup computer. A laptop computer in the EOF equipment locker is loaded with Windows 95 and Mesorem. This unit is intended to be used should an EOF relocation be necessary. An older laptop computer in the TSC equipment locker is loaded with Mesorem and intended to be available for use in a blackout condition (when normal power may be lost to much of the site). The Diesel Generator powering the TSC will provide power to run the laptop in that worst case situation.

4.2 A copy of the program is also available on PVNGS default Drive V: in Directory \Eplan\Mesorem\ for use by personnel in the Chemistry and Radiation Protection Groups to provide event support as required. However, the MESOREM-JR dose assessment program should not be executed on the LAN, as multi-user support is not possible. The program will run under MS Windows 95, MS Windows 98, or MS Windows NT (Version 4.0 or later) as a local copy. The program can also be executed on a computer running MS-DOS as the operating system.

4.3 To install MESOREM-JR from the LAN onto a local computer, create a directory on the local computer named MESOREM at the root level (i.e., C:\MESOREM). Download all MESOREM files from the LAN into the C:\MESOREM Directory on the local computer (2 MB HDD free space required). Execute the MESOREM.BAT File to start the program. (This action will place the user at the beginning of Section 2.0 in this procedure.) When finished with the program, delete all MESOREM files and the C:\MESOREM Directory from the local computer. Deletion of all MESOREM files on the local computer after use will ensure continuous synchronization of current MESOREM revision copies currently installed on all computers.

Appendix G - Core Damage Assessment

1.0 General Information

NOTE

This document directly supports PVNGS Unit 2 Sale / Leaseback Agreements. Any changes to or cancellation of the assessment methodology incorporated herein shall require review and approval by Arizona Public Service Company Law Department staff prior to implementation.

1.1 The APS employee tasked with performing the instructions within this document shall be current in qualifications and have records on file certifying successful completion of Training Course NGT69, Core Damage Assessment, or its equivalent, prior to performing the instructions within this document.

1.2 The principle method of core damage assessment (CDA) following an accident is based on radiochemistry data. Other plant indications may be available which can improve the estimation of core damage. These include incore temperature indicators, Containment radiation monitors, and the total quantity of Hydrogen released from Zirconium degradation. When possible, these additional indicators should be factored into the assessment.

1.3 PASS does not have the ability to obtain a sample representative of the water in the Containment sump until after a RAS occurs. Core damage estimates made using radiochemistry data during a small-break LOCA, in which a small amount of water is in Containment and a RAS has not yet occurred, shall only be made utilizing the off-gas data obtained from the Containment atmosphere and RCS samples. Once a RAS has occurred and suction has been transferred to the Containment sump, a sample can be obtained from the safety injection line.

1.4 The assessment of core damage obtained by using this document is only an estimate. The techniques employed in these instructions are only accurate in locating core conditions to within one or more of the ten (10) USNRC Fuel Damage Categories

1.5 Severe core damage does not occur uniformly. Damage occurring in regions of the core with higher power densities and along blocked channels will be more extensive than in other regions of the core. Therefore, the identification of a single USNRC Category may not sufficiently describe the actual damage state of the core. The most desired assessment is one made with the most accuracy and not necessarily the most conservatism.

1.6 Under emergency conditions, there can be extreme demands placed on the Chemistry Technician's time and on the sampling system. Conditions may change rapidly, requiring a re-evaluation of sample options and the cancellation of operations in progress to begin others. For this reason, it is important that efficient communications be established between the Shift Technical Advisor or Reactor Analyst, the Chemistry Coordinator, and the Emergency Coordinator.

2.0 Core Exit Thermocouple CDA Information

2.1 The assessment of core damage obtained by this method extends up to the time of clad rupture on most of the fuel rods. This time occurs early in very severe core uncovering accidents. More severe core damage cannot be quantified by the Core Exit Thermocouple (CET) assessment method.

2.2 The maximum CET temperature represents a low limit estimate of steam temperature and the peak core temperature could be up to 500ºF higher.

2.3 The curve in Figure 1 assumes that the fuel has been maintained at its rupture temperature for 10 minutes.

2.4 The CET temperature lags the steam temperature by about 6 minutes. Thus, this method is most appropriate for relatively slow core uncovering with a maximum temperature below the rapid oxidation initiation temperature of 1800ºF. A smooth CET recording and a time of 20 minutes (or longer) until the core uncovers are indicators for a reliable prediction of clad rupture.

2.5 If pressure drops below 100 psia within the first 2 minutes of indication of the accident, a large break is indicated and undetected core heatup will occur. Depending on the rate of refill, the thermocouple temperature may rise rapidly, then quench when the core is recovered. This method may yield very low estimates of clad rupture in these cases.

2.6 If the RCS pressure, at the time of maximum CET readings, is greater than 1650 psia, it could exceed the rod internal gas pressure, depending on burnup. This could cause clad collapse rather than clad ballooning. The clad rupture criteria for such rod collapse are less well defined. However, at temperatures in excess of 1800ºF (where the highest pressure curve on Figure 1 applies), clad failure sufficient to release fission gas is likely and this method can be used to obtain estimates of core damage.

2.7 If a peak CET temperature of 2200ºF is reached, over 50% of the rods have ruptured, regardless of core burnup or system pressure.

3.0 Containment Radiation Monitor (RMS) CDA Information

3.1 This method of core damage assessment relies upon radiation dose rate measurements taken from one or more monitors located inside the Containment Building to determine the total quantity of fission products released from the core. The quantity of fission products present at the location of the monitors may fluctuate rapidly due to transient plant conditions; therefore, multiple measurements within a minimum time frame are recommended. Samples obtained during rapidly changing plant conditions should not be weighed heavily in the assessment of core damage. If RU-148 and RU-149 are both not available for dose rate measurements, equivalent readings can be obtained from the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Assessment Coordinator in the Emergency Operations Facility.

3.2 This method is limited to the upper bounding condition of fission product release from the core due to fuel overheat. Concurrent with fuel overheat, there may be localized fuel pellet melting. This method does not attempt to identify the extent of any potential fuel melting, since the transport of non-volatile fission products released due to melting is not known.

3.3 This method is limited to the interpretation of the dose rate measurement resulting from a mix of fission products. Thus, this method cannot accurately distinguish between the conditions of fuel cladding failure and fuel overheat when the resulting dose rates are the same. This method does provide an upper limit estimate of the progressive core damage. Concurrent conditions of cladding failure and fuel overheat should be anticipated due to radial distribution of heat generation within the core.

3.4 A number of factors influence the reliability of the measured radiation dose rates upon which this method is based. Reliability is influenced by the ability to obtain representative measurements due to the incomplete mixing of the measured media and equipment limitations. The method relies on analytically determined values of the best estimate dose rates that are anticipated to correspond to the specific categories of core damage. These analytical values are based on assumptions made about the identity and the relative proportions of the fission products released from the core and their transport within Containment.

3.5 Dose rate measurements may have been obtained during transient conditions. Measurements taken during steady-state conditions should weigh more heavily.

3.6 Dose rates significantly above the lower bounds for the category of major fuel pellet overheat may indicate concurrent fuel pellet melting. This method may not be used to estimate the degree of fuel pellet melting.

3.7 Dose rates within the category of fuel overheating may be anticipated to include concurrent fuel cladding failure. This method may not be used to distinguish the relative contributions of the two categories to the total dose rate. The method does provide an estimate of the highest category of damage and assumes 50% of core Iodines are available for release to Containment. This number may be over-estimated, thus resulting in a non-conservative damage assessment.

3.8 Dose rates corresponding to the two categories of major fuel cladding failure and initial fuel overheat are observed to overlap in Figure 2. The evaluation of other plant parameters may be required to distinguish between them. However, concurrent conditions may be anticipated.

3.9 Several assumptions were made in the calculations performed to generate the graph of Figure 2. They include:

3.9.1 The distribution of all airborne radionuclides in the Containment atmosphere is homogeneous.

3.9.2 The dose rates were measured at the Containment top-centerline.

3.9.3 The Containment Spray System has operated for 2 hours and has effected a halogen reduction by a factor of 7.

3.9.4 The gamma flux at the detector was determined by the point kernel method.

4.0 Hydrogen Production CDA Information

4.1 This method of core damage assessment is not a unique indicator of the amount of core clad oxidation, since the Hydrogen in Containment contains a mixture of Hydrogen generated within the core by clad oxidation and also Hydrogen from radiolytic dissociation of water and oxidation of aluminum and zinc.

4.2 This method only provides an estimate of the percentage of rods which have progressed to at least clad rupture or clad embrittlement. It does not attempt to predict the physical configuration of these rods which have progressed beyond local clad fragmentation.

4.3 Depending on the accident conditions, a given total amount of Hydrogen produced by oxidation of the fuel clad can represent varying local amounts and distributions of clad damage. This method biases the damage estimates such that the results represent lower limit estimates of clad damage.

4.4 The basis for this assessment assumes zero inlet flow into the core and also assumes the two-phase level within the core is uniform across the entire core.

4.5 By the time that 0.5% of the core clad has oxidized during boil-off, between 40% and 100% of the rods can be considered to be ruptured, depending on system pressure. Hydrogen measurement serves only as a backup to more sensitive methods of determining clad rupture. If the Hydrogen measurement indicates greater than 20% of the clad has oxidized, then substantial core damage is certain, regardless of the particular reflood scenario. For a given percent of oxidation of the core clad, the lower limit estimate of embrittled clad in the assessment of the percent of embrittled fuel rods is for most scenarios, which presents the least amount of potential structural damage. The actual damage is probably greater.

4.6 When the pressure during core uncovering is less than about 100 psia, a rapid core uncovering by blowdown has probably occurred. Heatup with minimum clad oxidation occurs. The extent of potential clad structural failure by melting may be greater than the upper limit of embrittlement as determined by core clad oxidation.

4.7 If inlet flow exists while the core is uncovering, the rate of uncovering is slower than was assumed for the derived curves of the figures used in this method. For a measured total amount of oxidation, the local percentage of oxidation is probably greater along a shorter length of the upper portions of the fuel.

4.8 This method is not acceptable under conditions where a void exists in the Reactor Coolant System.

5.0 Radiological Analysis CDA Information

5.1 This method relies on samples obtained from multiple locations inside the Containment Building to determine the total quantity of fission products released from the core. The amount of fission products present at each sample location may be changing rapidly due to transient plant conditions. Therefore, an accurate assessment requires that the samples be completed within a minimum time period and obtained under stabilized plant conditions. Samples obtained during rapidly changing plant conditions should not be weighed heavily into the assessment of core damage.

5.2 Samples obtained during the accident at TMI-2 indicate that the amount of Iodine predicted to be released is grossly over-estimated.

5.3 A number of factors influence the reliability of the Chemistry samples upon which this method is based:

5.3.1 Reliability is influenced by the ability to obtain representative samples due to incomplete mixing of the fluids and by equipment limitations.

5.3.2 The accuracy achieved in the radiological analyses are also influenced by a number of factors:

5.3.2.1 The equipment employed in the analysis may be subjected to high levels of radiation exposure over extended periods of time.

5.3.2.2 Technicians are required to exercise considerable caution to minimize the spread of radioactive materials.

5.3.2.3 Samples have the potential of being contaminated by numerous sources and may not be representative.

5.3.2.4 Plate-out, precipitation, and chemical reactions may take place in the long sample lines. Therefore, the results obtained may not be representative of actual plant conditions.

5.3.3 To minimize these effects, multiple samples should be obtained over an extended time period from each location.

6.0 Core Damage Evaluation

6.1 The core damage estimate methods presented are not required to be performed in any given order and all methods may not be appropriate for the given accident scenario. However, it is recommended that as many applicable methods as necessary be used prior to making a final assessment of core damage. The figures in this document will aid in the assessments.

6.2 For core damage assessment using Core Exit Thermocouples, complete Form EP-0511, Core Exit Thermocouple CDA (see Appendix C - Forms).

6.3 For core damage assessment using Containment radiation monitors, complete Form EP-0512, Containment RMS CDA (see Appendix C - Forms).

6.4 For core damage assessment using Hydrogen production, complete Form EP-0513, Containment Hydrogen CDA (see Appendix C - Forms)

6.5 For core damage assessment using radiological analysis, complete Form EP-0514, Containment Radiochemistry CDA (see Appendix C - Forms).

6.6 When all applicable methods for assessing core damage have been completed, make a final assessment utilizing all available information from the four methods of assessment. The final assessment requires sound engineering judgment and knowledge of all biases and assumptions discussed under Personnel Indoctrination in Section 1.0 through 5.0 of this document.

6.7 Using the previously mentioned considerations, evaluate the final assessment of core damage for accuracy.

6.8 Using section 7.0, Fuel Damage Categories, compare the results obtained for the final core damage assessment to the USNRC Categories of Fuel Damage and select the category most accurately matching that derived in the final assessment.

6.9 Report the results obtained from the comparison to the Emergency Coordinator as soon as possible.

7.0 Fuel Damage Categories

7.1 Use the table below for comparisons with the final core damage assessment obtained in steps 6.2 through 6.9.

CATEGORY	FUEL DAMAGE
1	No Fuel Damage
2	Initial Cladding Failure
3	Intermediate Cladding Failure
4	Major Cladding Failure
5	Initial Fuel Pellet Overheating
6	Intermediate Fuel Pellet Overheating
7	Major Fuel Pellet Overheating
8	Fuel Pellet Melt
9	Intermediate Fuel Pellet Melt
10	Major Fuel Pellet Melt

7.2 Clad damage characteristics of fuel damage

CLAD DAMAGE CHARACTERISTICS OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	TEMPERATURE RANGE °F	MECHANISM OF DAMAGE	CHARACTERISTIC MEASUREMENT	MEASUREMENT RANGE	PERCENT OF DAMAGED RODS
1. No Fuel Damage	750	None			< 1
2. Initial Cladding Failure			Maximum Core Exit Thermocouple Reading	< 1550°F	< 10
3. Intermediate Cladding Failure	1200-1800	Rupture Due to Pin Overpressure		< 1700°F	10-50
4. Major Cladding Failure				< 2300°F 1-5% Oxidation	> 50
5. Initial Fuel Pellet Overheating	1800-3350			Core Oxidation 1-5%	< 10
6. Intermediate Fuel Pellet Overheating		Loss of Structure Integrity Due to Fuel Clad Oxidation	Amount of Hydrogen Gas Produced *(Equivalent to % of Core Oxidation)*	5-20%	10-50
7. Major Fuel Pellet Overheating	3450			20-65%	> 50

NOTE: This table is to be used for both the CET and Hydrogen methods of core damage assessment

PV216-04N (8-84)

7.3 Dose rate characteristics of USNRC categories of fuel damage

DOSE RATE CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY	DISTRIBUTION OF FISSION PRODUCTS IN CONTAINMENT
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	< 1%	Airborne
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	< 10%	Airborne
3. Intermediate Cladding Failure		Gas Gap	10-50%	Airborne
4. Major Cladding Failure		Gas Gap	> 50%	Airborne
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	< 10%	Airborne: 100% Noble Gas 25% Halogen Plated Out: 25% Halogen 1% Solids
6. Intermediate Fuel Pellet Overheating		Fuel Pellet	10-50%	
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet	> 50%	

NOTE: This table is to be used for the Containment Radiation Monitor method of core damage assessment

PV216-08N (8-84)

7.4 Radiological characteristics of USNRC categories of fuel damage

RADIOLOGICAL CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

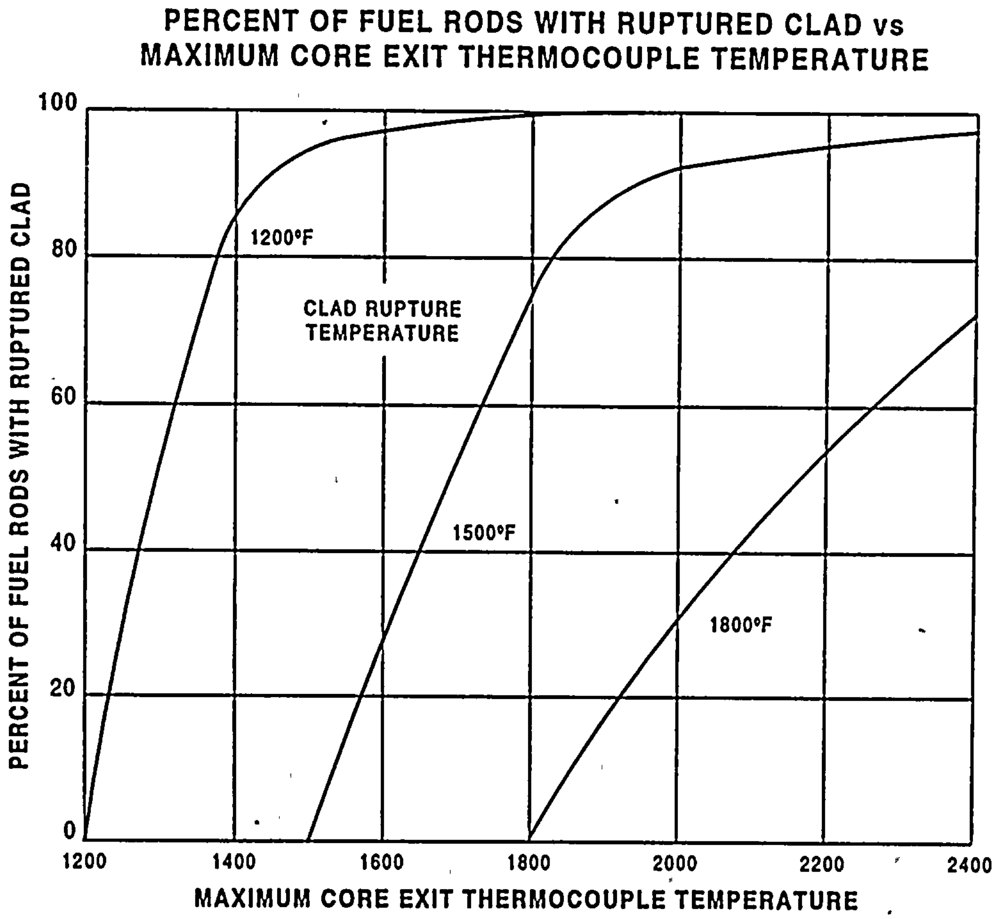
USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	CHARACTERISTIC ISOTOPE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	I^{131}, Cs^{137}, Rb^{88}	< 1%
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	Xe^{131m}, Xe^{133}, I^{133}	< 10%
3. Intermediate Cladding Failure		Gas Gap		10-50%
4. Major Cladding Failure		Gas Gap		> 50%
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	Cs^{134}, Rb^{88}, Te^{129}, Te^{132}	< 10%
6. Intermediate Fuel Pellet Overheating		Fuel Pellet		10-50%
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet		> 50%
8. Fuel Pellet Melt	Escape from Molten Fuel	Fuel Pellet	Ba^{140}, La^{140}, La^{142}, Pr^{144}	< 10%
9. Intermediate Fuel Pellet Melt		Fuel Pellet		10-50%
10. Major Fuel Pellet Melt		Fuel Pellet		> 50%

NOTE: This table is to be used for the Radiochemistry method of core damage assessment

8.0 Figures

8.1 Figure 1 - Percent of fuel rods with ruptured clad vs. maximum Core Exit Thermocouple temperature

FIGURE 1

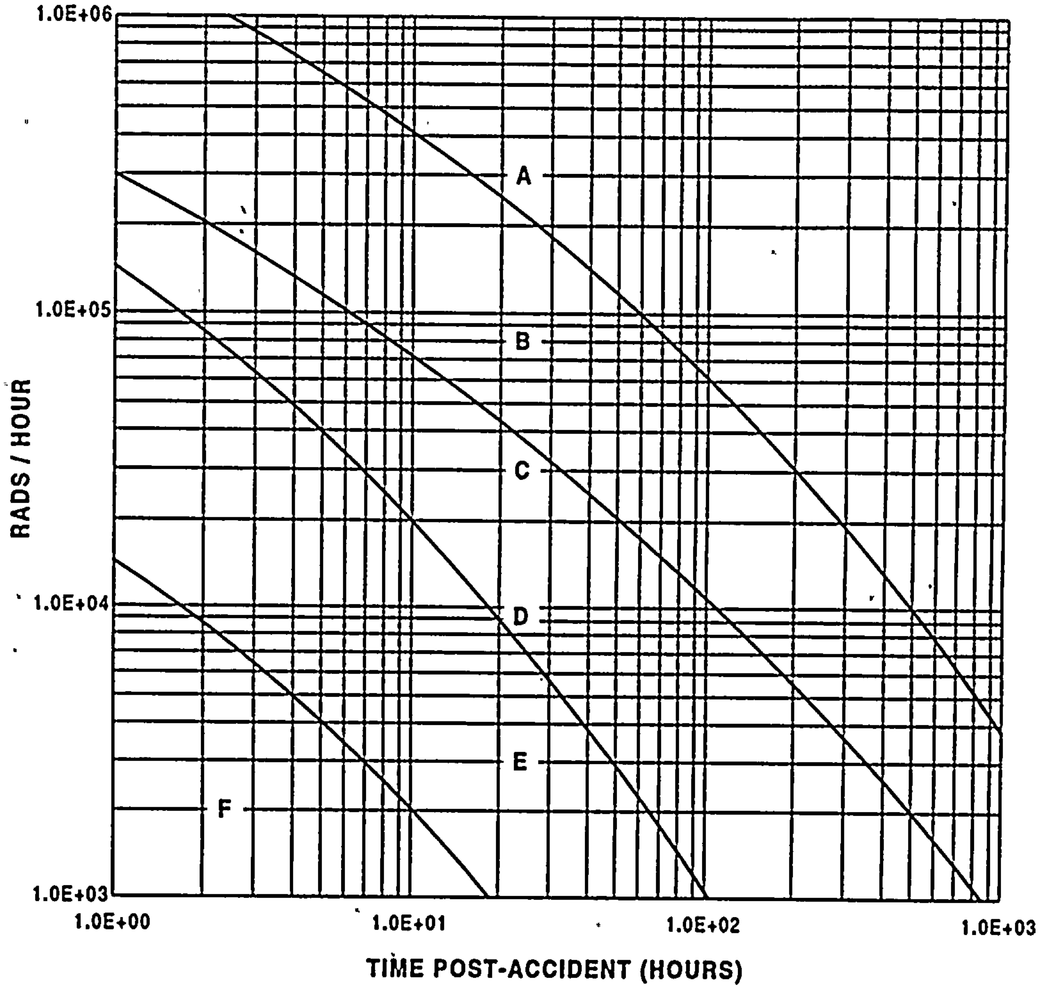


When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.2 Figure 2 - CDA by Containment radiation level

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL

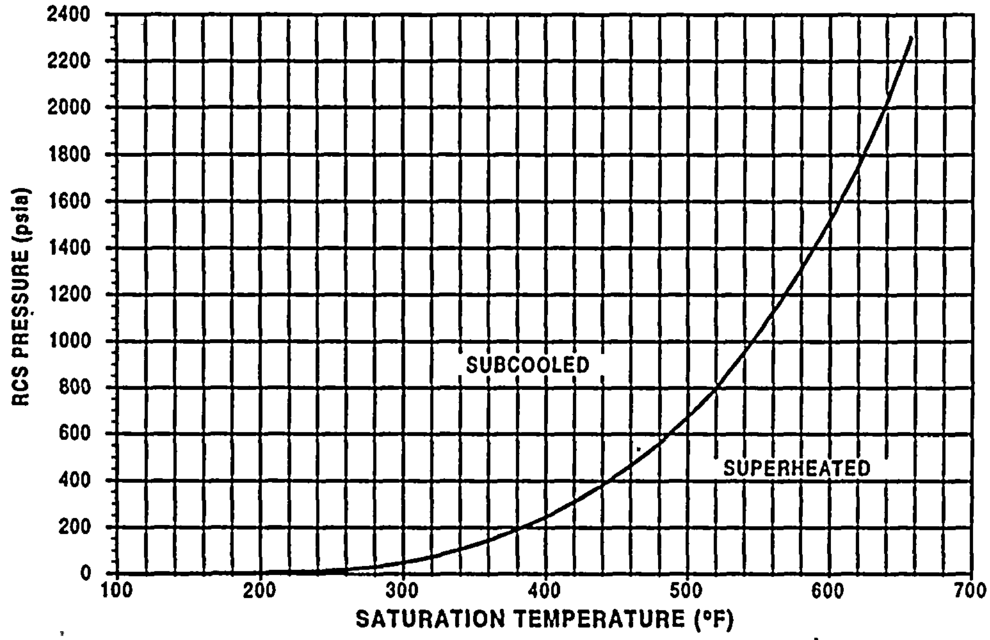


A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

8.3 Figure 3 - Pressure vs saturation temperature

FIGURE 3

PRESSURE vs SATURATION TEMPERATURE



8.4 Table - Pressure vs saturation temperature

PRESSURE vs SATURATION TEMPERATURE													
psia	xF	psia	xF	psia	xF	psia	xF	psia	xF	psia	xF	psia	xF
20	228.0	130	347.3	240	397.4	550	476.9	1100	556.3	1650	609.1	2400	662.1
30	250.3	140	353.0	250	401.0	600	486.2	1150	561.8	1700	613.1	2500	668.1
40	267.3	150	358.4	260	404.4	650	494.9	1200	567.2	1750	617.1	2600	673.9
50	281.0	160	363.6	270	407.8	700	503.1	1250	572.4	1800	621.0	2700	679.5
60	292.7	170	368.4	280	411.1	750	510.8	1300	577.4	1850	624.8	2800	685.0
70	302.9	180	373.1	290	414.3	800	518.2	1350	582.3	1900	628.6	2900	690.2
80	312.0	190	377.5	300	417.4	850	525.2	1400	587.1	1950	632.2	3000	695.3
90	320.3	200	381.8	350	431.7	900	532.0	1450	591.7	2000	635.8	3100	700.3
100	327.8	210	385.9	400	444.6	950	538.4	1500	596.2	2100	642.8	3200	705.1
110	334.8	220	389.9	450	456.3	1000	544.6	1550	600.6	2200	649.5	3208	705.5
120	341.3	230	393.7	500	467.0	1050	550.5	1600	604.9	2300	655.9		

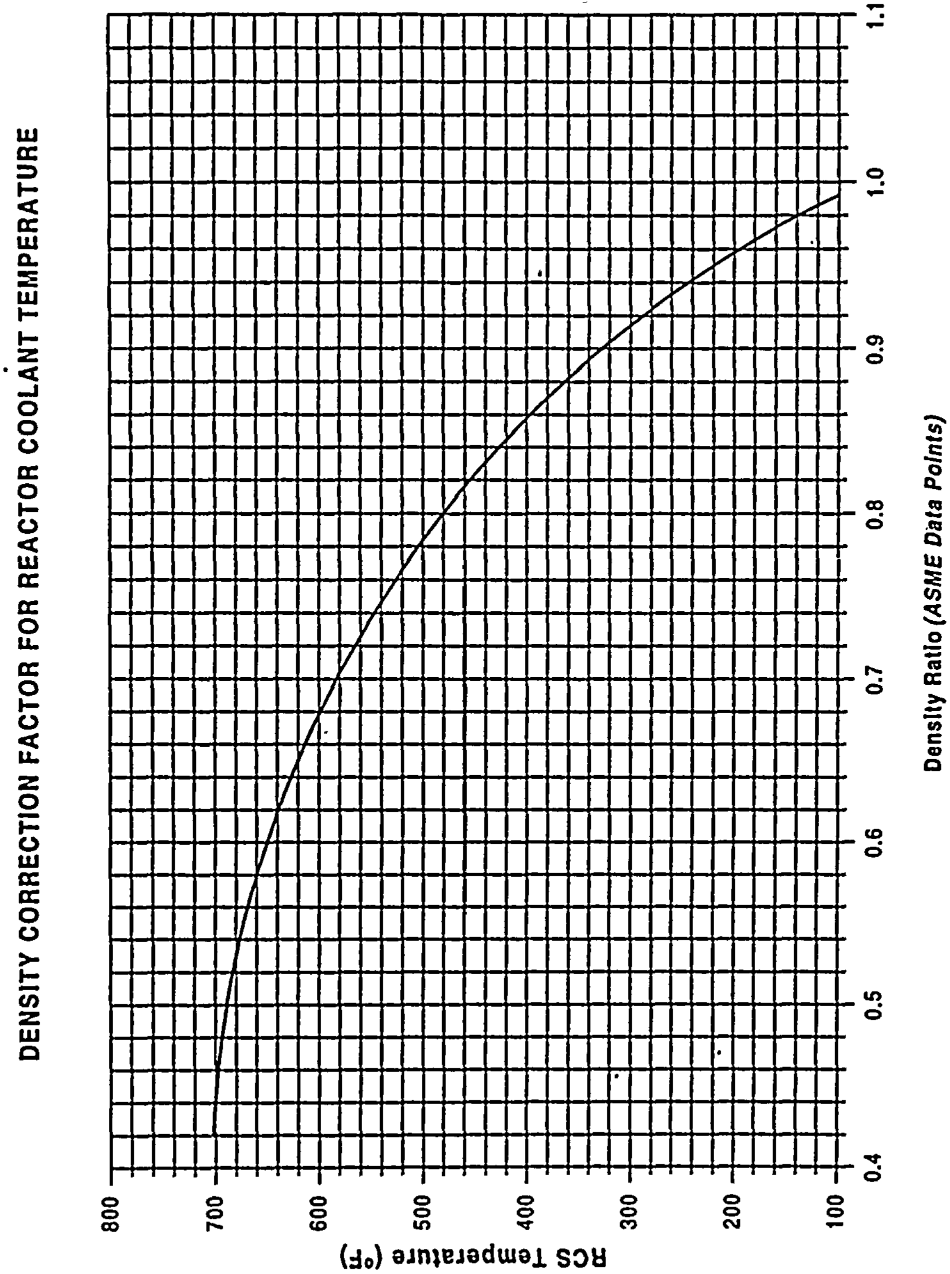
8.5 Figure 4 - RCS vessel level vs. volume

8.5.1 When the RCS is full, the RCS volume = 3.78E+08 cc. To determine the RCS water volume when the RCS is not full, the Reactor Vessel Level Monitoring System (RVLMS) is used. This system includes 8 detectors located at different levels in the reactor vessel. The approximate RCS level can be determined by how many detectors have uncovered. The information below provides the volume to be used at each detector location:

DETECTOR	VOLUME BELOW *(cc)*
HJTC #1	1.51E+08
HJTC #2	1.37E+08
HJTC #3	1.22E+08
HJTC #4	1.08E+08
HJTC #5	1.02E+08
HJTC #6	9.68E+07
HJTC #7	9.12E+07
HJTC #8	8.57E+07

8.6 Figure 5 - Density correction factor for reactor coolant temperature

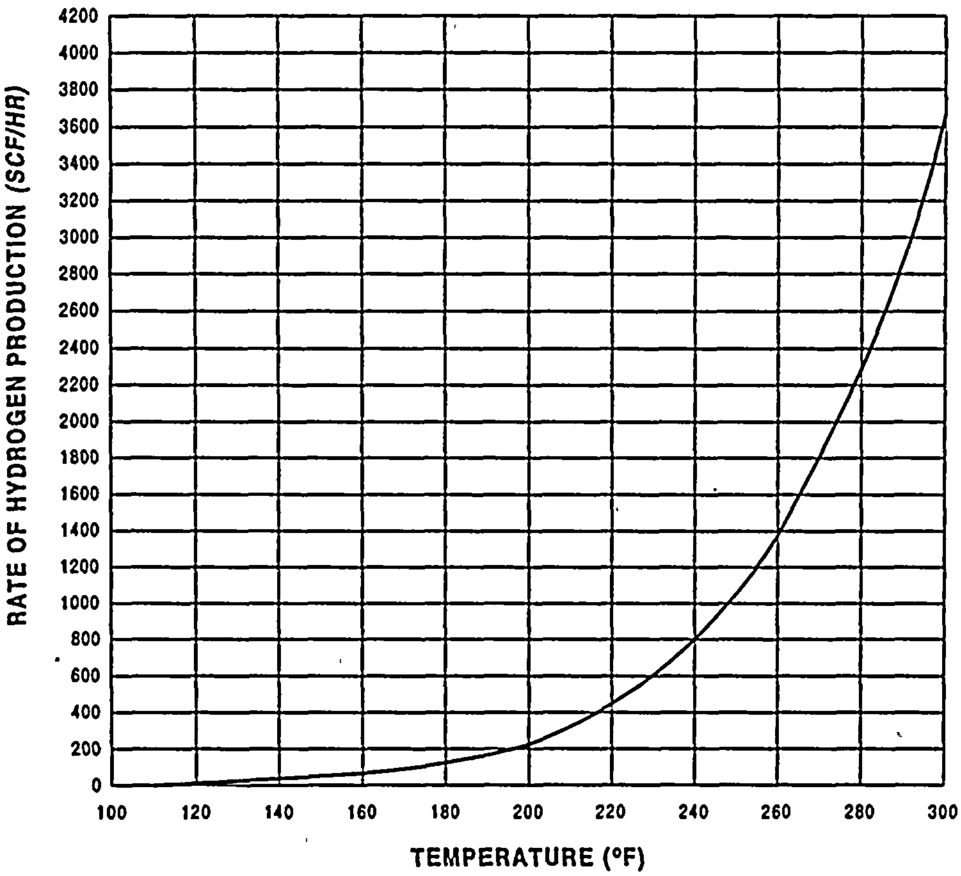
FIGURE 5



8.7 Figure 6 - Hydrogen production rate from aluminum and zinc vs. temperature for PVNGS

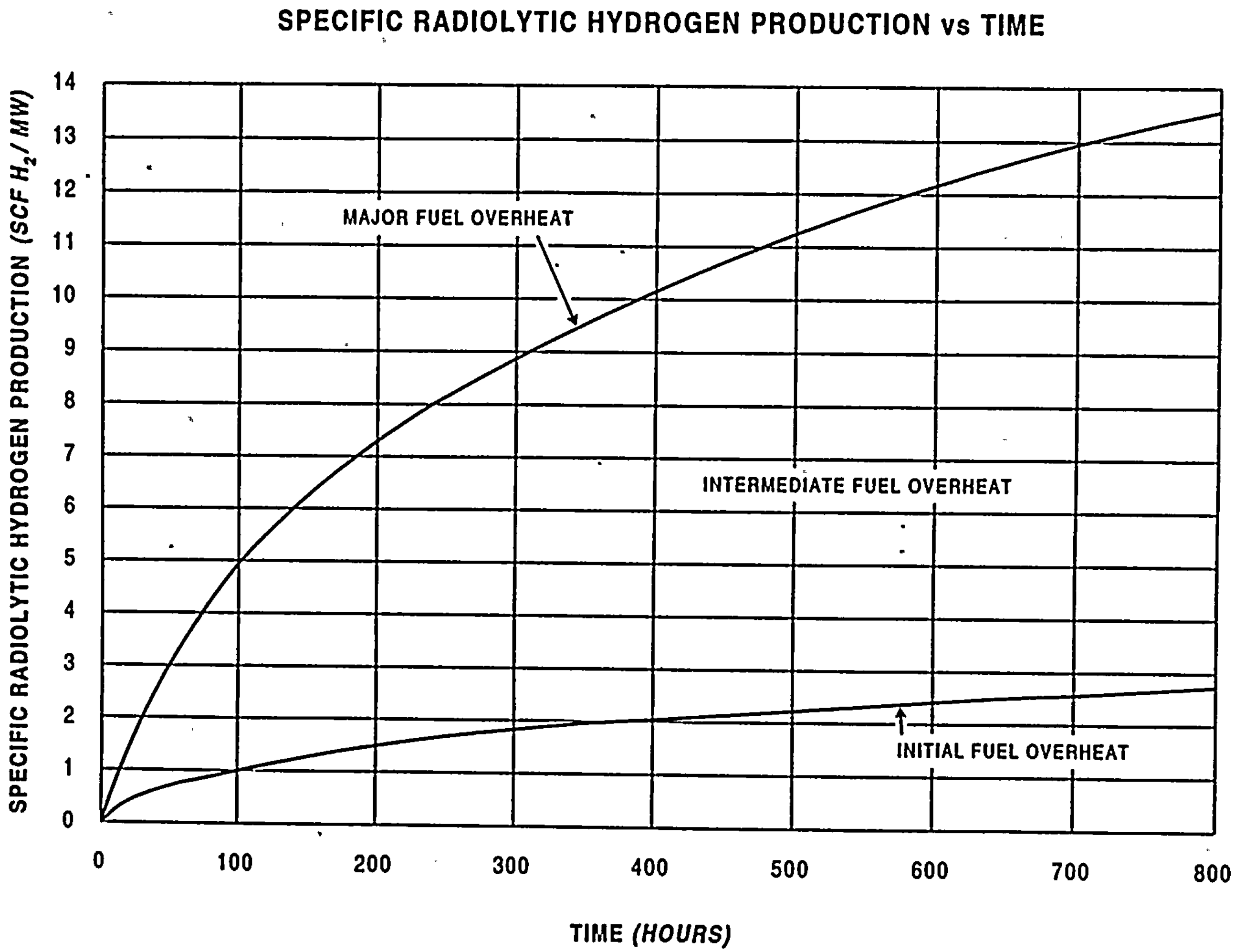
FIGURE 6

HYDROGEN PRODUCTION RATE FROM ALUMINUM AND ZINC vs TEMPERATURE FOR PVNGS



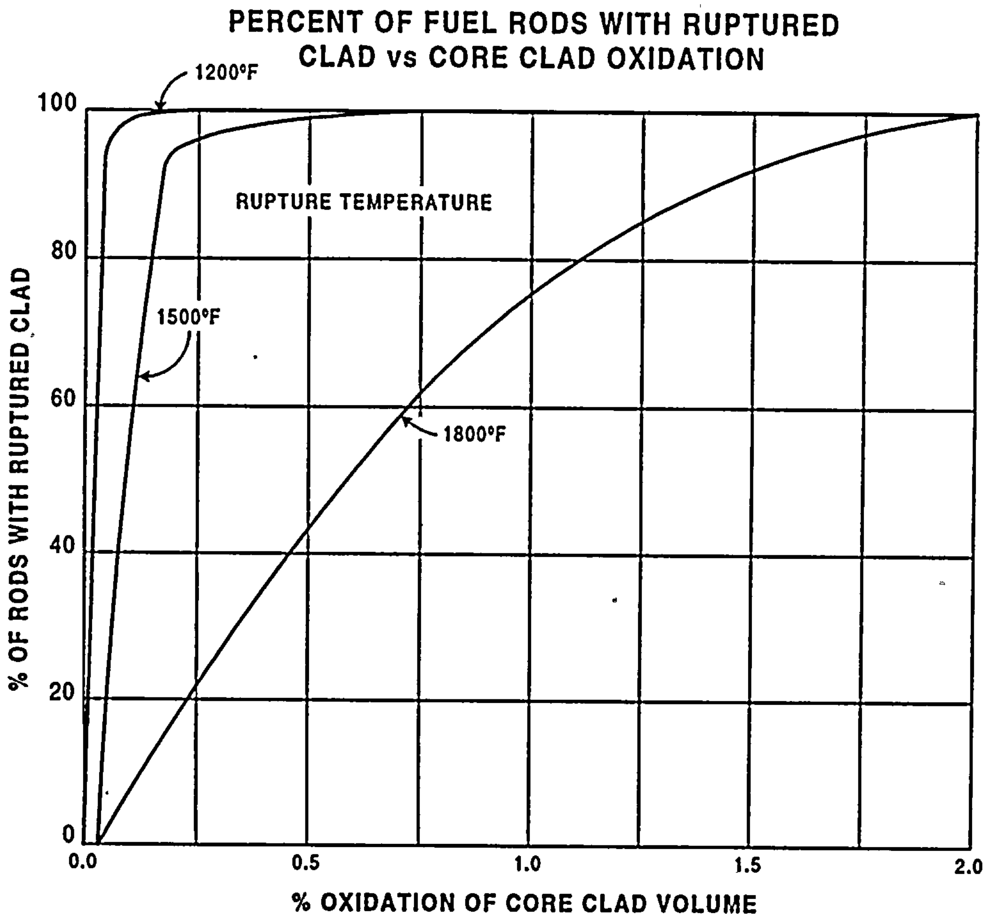
8.8 Figure 7 - Specific radiolytic hydrogen production vs. time

FIGURE 7



8.9 Figure 8 - Percent of fuel rods with ruptured clad vs. core clad oxidation

FIGURE 8

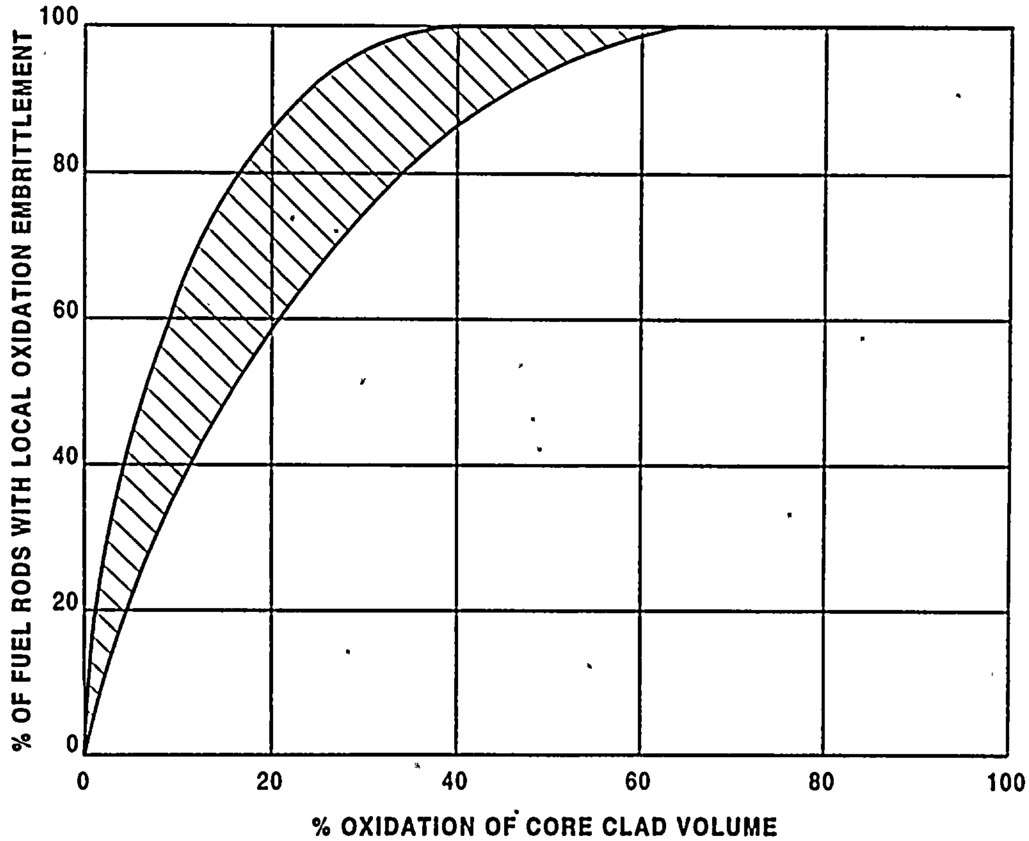


When the pressure in Form EP-0513, Step 2, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.10 Figure 9 - % of the fuel rods with oxication embrittlement vs. total core oxidation for 1% to 3% decay heat and 300 PSIA to 2500 PSIA when coolant level drops by boil-off with no inlet flow until core is rapidly quenched

FIGURE 9

% OF THE FUEL RODS WITH OXIDATION EMBRITTLEMENT vs TOTAL CORE OXIDATION FOR 1% TO 3% DECAY HEAT AND 300 PSIA TO 2500 PSIA WHEN COOLANT LEVEL DROPS BY BOIL-OFF WITH NO INLET FLOW UNTIL CORE IS RAPIDLY QUENCHED



8.11 Figure 10 - Sample locations appropriate for core damage assessment

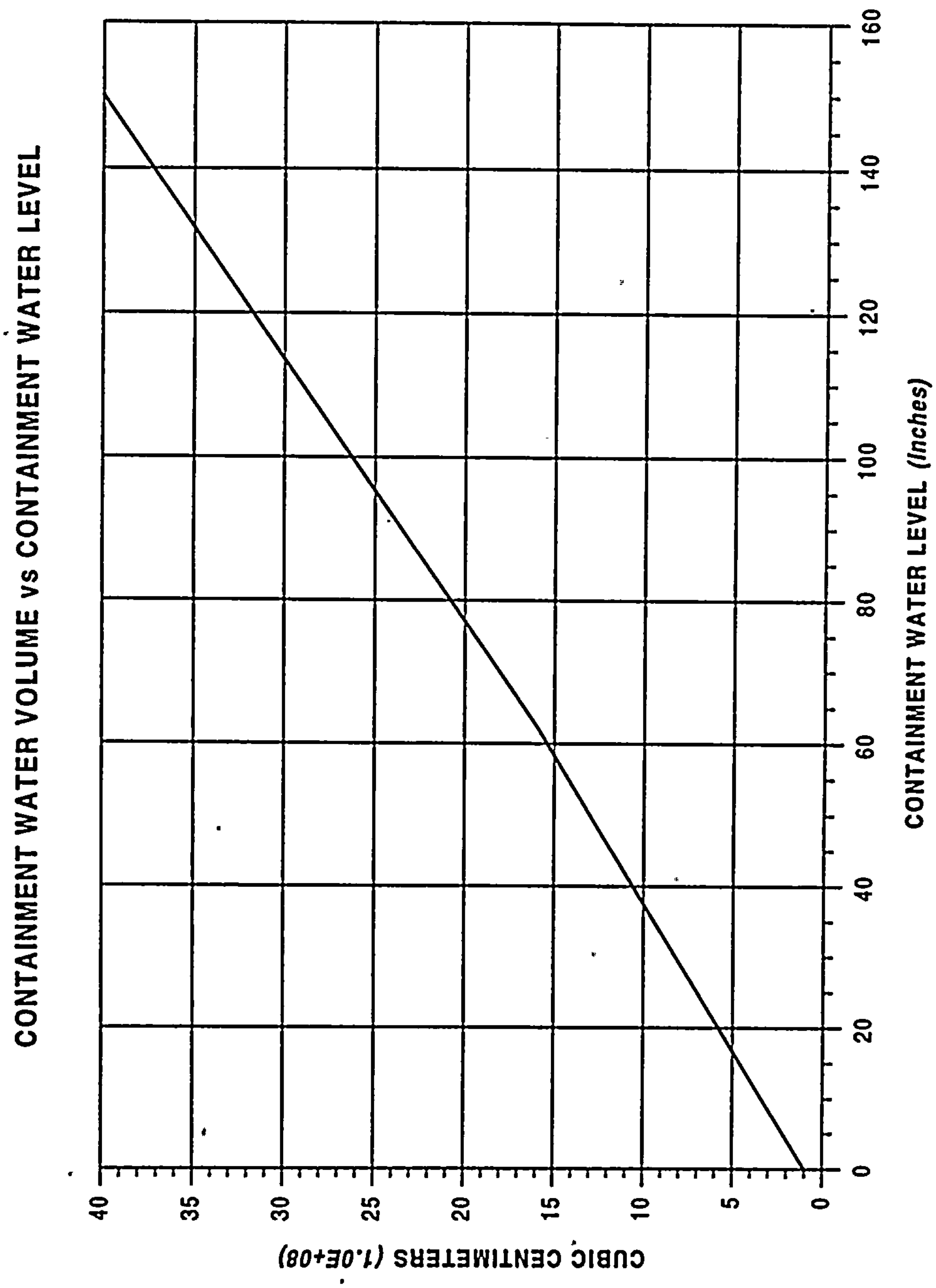
FIGURE 10

SAMPLE LOCATIONS APPROPRIATE FOR CORE DAMAGE ASSESSMENT

ACCIDENT SCENARIO	RCS HOT LEG	CONTAINMENT SUMP	CONTAINMENT ATMOSPHERE	SHUTDOWN COOLING
Small Break LOCA Reactor Power > 1%	YES	....	YES	YES
Small Break LOCA Reactor Power < 1%	YES	....	....	YES
Small Steam Line Break	YES	....	....	....
Large Break LOCA Reactor Power ≥ 1%	YES	YES	YES	YES
Large Break LOCA Reactor Power < 1%	....	YES	YES	YES
Large Steam Line Break	YES	....	YES	....
Steam Generator Tube Rupture	YES	....	YES	....

8.12 Figure 11 - Containment water volume vs. Containment water level

FIGURE 11



Appendix H - Autodialer Activation

NOTE

If the declared emergency situation is terminated prior to activation of the autodialer, do not activate the autodialer. The Shift Manager / Emergency Coordinator will direct the use of the autodialer. If the autodialer cannot be activated from the PVNGS Technical Support Center, contact Emergency Planning for assistance.

1.0 Activating the autodialer.

1.1 Power up the autodialer unit.

1.2 When the "ATERM" screen appears, press <F2>.

1.3 At the "Enter Password" prompt, type mlog and press <ENTER>.

1.4 Select the "Administrator" option and press <ENTER>.

1.5 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.6 Type your password and press <ENTER>.

1.7 Scroll down slowly and highlight the appropriate option from the following choices:

1.7.1 Unit 1 Setup (for Emergency Response Notifications)

1.7.2 Station Setup (for Fire Department activation)

1.8 When the appropriate option is highlighted, press <ENTER>.

1.9 Highlight the appropriate selection from the following choices:

1.9.1 E (actual emergency) / (classification)

1.9.2 D (drill) / (classification)

1.9.3 T (test) / (classification)

1.10 When the appropriate selection is highlighted, press <ENTER>.

1.11 When the "Working - Please Wait" dialog box disappears, press <ESC> two times.

NOTE

There may be a file transfer operation at this point. In a case of the file transfer dialog on the screen, wait until file transfer is completed (dialog box disappears) before continuing on to next step.

1.12 Select the "Administrator" option again and press <ENTER>.

1.13 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.14 Type your password and press <ENTER>.

1.15 Select the appropriate designator from the following choices:

1.15.1 Emergency Activation

1.15.2 Drill Activation

1.15.3 Test Activation

1.16 When the appropriate option is highlighted, press <ENTER>.

1.17 Select the appropriate Unit and press <ENTER>.

CAUTION

Selecting the option "Yes" (Y) in the next step STARTS activation. There is no additional confirmation step to allow you to back out of an activation prior to its commencement if you select the "Yes" option.

1.18 At the prompt "You have selected system (Emergency/Drill/Test) Activation for (UNIT 1/2/3/PVNGS STATION) location. The system is not currently staffing. Are you certain that you wish to continue?", type Y (yes) or N (no).

1.19 Ensure that the system has been activated by verifying the appearance of status screens displaying Emergency Response Organization position information as responders are reached.

1.20 If the autodialer failed to activate or failed to complete the notification process, notify the Shift Manager / Emergency Coordinator that the autodialer in the Technical Support Center failed the activation process. If necessary, inform the Emergency Coordinator of the current status of the system.

2.0 Terminating the autodialer activation.

2.1 From the "Monitoring Staffing for Unit (1/2/3/PVNGS Station)", select <F2> "Stop Staffing".

2.2 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.3 Type your password and press <ENTER>.

2.4 A "Real Time" fax report dialog box will display followed by a "Working - Please Wait" dialog box. When the "Working - Please Wait" dialog box disappears, the "Monitoring Staffing" screen also disappears.

2.5 The main Coordinator screen appears with "(RE)ACTIVATED, NOT STAFFING" in the left side of the upper box on the screen.

2.6 Select the "Administrator" option and press <ENTER>.

2.7 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.8 Type your password and press <ENTER>.

2.9 Select the "RESET" option and press <ENTER>.

2.10 After the "Working - Please Wait" dialog box disappears, press the <ESC> key once.

2.11 Select the <CTRL> + <RIGHT SHIFT> (Hold down the "control" key and simultaneously press the "Shift" key on the right hand side of the keyboard), to bring up the ATERM SPECIAL FUNCTIONS dialog box. Highlight "END ATERM SESSION" and press <ENTER>.

2.12 The ATERM Login screen should appear. This action terminates the modem session from the workstation to the Autodialer.

2.13 When emergency notifications have been completed, inform the Emergency Coordinator of any unaffirmed Emergency Response Organization positions.

Appendix I - Assembly

1.0 General information

1.1 Assembly is recommended at the Alert classification level unless the Emergency Coordinator is reasonably assured that the condition does not have the potential to further degrade. Accountability is required for a Site Area Emergency or a General Emergency and must be completed within 30 minutes following the request for Accountability. Accountability does not have to be performed immediately following the request for Assembly.

1.2 Designated Assembly Areas within the Protected Area are the Control Room/Satellite Technical Support Center, Technical Support Center, Operations Support Center, and Containment (Modes 5, 6, and Defueled, if appropriate). Designated Assembly Areas beyond the Protected Area are major buildings within the Owner Controlled Area having the capability of receiving Plant Paging System announcements.

1.3 Essential personnel are Emergency Response Organization personnel currently required for duty, and individuals engaged in Emergency Coordinator authorized critical work. If directed, essential personnel in an Unaffected Unit who normally respond to their Assembly Area will respond to the Affected Unit Assembly Area.

1.4 If the Security Computer System is not functioning, Security personnel will manually account for Protected Area personnel at Security Headquarters. Protected Area Assembly Area supervision will accommodate accordingly at each of their respective locations.

2.0 Emergency Coordinator actions

2.1 For Assembly/Accountability (required for SAE and GE, optional for Alert), perform the following:

2.1.1 Sound the Unit Assembly Signal for approximately 30 seconds.

2.1.2 Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a ____________________ exists in Unit ___. Assembly is required. All personnel report to your designated Assembly Area." Provide instructions on areas to avoid as appropriate.

2.1.3 Repeat sounding the Unit Assembly Signal and the message once. This responsibility can be delegated.

2.1.4 Direct the Security Director to complete supplemental onsite notifications and activate the autodialer (6470 / 6471 / 6472, 4444 or dedicated line or radio).

2.1.5 Personnel assembly is accomplished as follows:

2.1.5.1 Personnel in Containment are to secure work safely, report to the 140' hatch, and await instructions.

2.1.5.2 Emergency Response Organization members are to report to their Emergency Response Facilities.

2.1.5.3 Personnel in the Protected Area engaged in EC-authorized critical work are to report to the OSC, STSC, or TSC and card in on the ACAD card reader before returning to work.

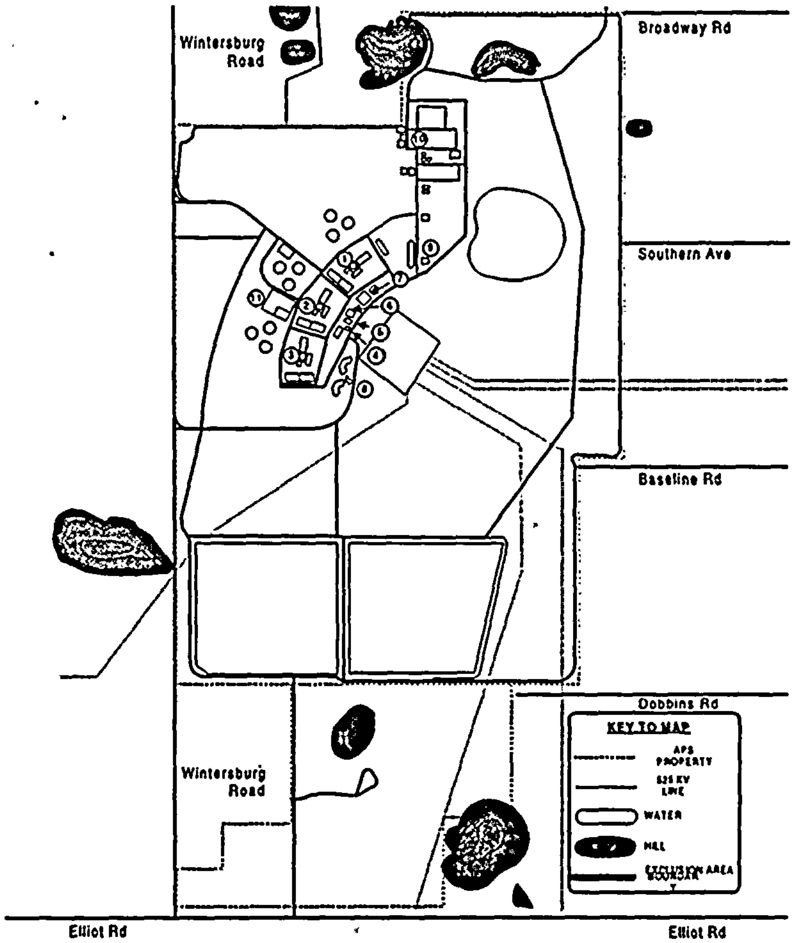
2.1.5.4 All other personnel, whether inside or outside the Protected Area., are to report to the nearest Assembly Area outside the Protected Area. These are considered to be non-essential personnel.

2.1.6 Ensure that assembling personnel each register their ACAD in the card reader. If the ACAD card reader is inoperable, direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms). Collect all forms and fax them to CAS.

2.1.7 To terminate Assembly by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.1.8 To terminate Assembly by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

The following site map details designated Assembly Areas to be used for assembling personnel when Assembly has been directed by the Emergency Coordinator.



Protected Area	Owner Controlled Area
1. Unit 1 Power Block	6. Building D
2. Unit 2 Power Block	7. Buildings E and F
3. Unit 3 Power Block	8. Buildings A, B, C
4. Security Headquarters	9. Transportation
5. Technical Support Center	10. Water Reclamation Facility Admin
	11. North Annex and Warehouse

2.2 If Accountability is to be conducted after Assembly, perform the following:

2.2.1 Request CAS Security personnel (6470 / 6471 / 6472, or 4444 or dedicated line or radio) to perform Accountability and to provide the report within 30 minutes.

2.2.2 Advise the Security Director to locate any unaccounted individuals.

2.2.3 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

2.2.4 Maintain continuous accountability of STSC personnel after Assembly. It is the position of PVNGS management that continuous accountability be maintained by knowledge of those individuals inside, and controlling access to, the Protected Area. Specific locations, i.e., Sector designation, of individuals inside the Protected Area may be ascertained by various methods, such as use of the Security Computer System and associated ACAD card readers, use of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms) in the OSC, Protected Area Assembly Area Supervisor knowledge, and Central Alarm Station (CAS) Operator knowledge. It is through a combination of these available administrative resources that continuous accountability of personnel inside the Protected Area can be maintained. The responsibility for maintaining continuous accountability of personnel within the envelope of each of the emergency response facilities within the Protected Area lies with the appropriate facility manager.

2.2.5 To terminate Accountability by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.2.6 To terminate Accountability by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

2.2.7 To terminate Accountability by a Site Evacuation, see Appendix J - Site Evacuation.

3.0 **Security Director actions**

3.1 When Assembly is directed, search the following areas in each Unit:

3.1.1 A-213 / A-217, CEDMCS Rooms

3.1.2 AC-04 / AC-13, Containment Spray Pump Rooms

3.1.3 AC-05 / AC-10, LPSI Rooms

3.1.4 AB-08, Gas Stripper Room

3.1.5 AB-02 / AB-10 / AB-11, 77' / 87' Mechanical Penetration Rooms

3.1.6 Y-105 / Y-106, 84' Pipe Density Tunnel

3.1.7 F-106, Fuel Cask Loading Area

3.1.8 R-211, 120' Radwaste Control Room

3.1.9 A-108 / A-109, 100' EW Heat Exchanger Rooms

3.1.10 A-124 / A-123, 88' Essential Pipe Chase

3.1.11 A-231 / A-232, Valve Gallery

3.1.12 A-210 / A-217 / A-218, Boron Injection Rooms

3.1.13 A-312 - R-303 - R-308, Waste Gas Panel Aisle

3.1.14 Y-101, 90' Nuclear Cooling Condensate

3.1.15 C-111, MSSS 100' Valve and Pipeway Area

3.1.16 Y-102 / Y-103, Spray Pond Pump Rooms

3.1.17 TSC Diesel Room

3.2 Search the following non-designated Assembly Areas and buildings outside the Protected Area for personnel:

3.2.1 Evaporation Ponds

3.2.2 SRP Switchyard

3.2.3 80-Acre Lake

3.2.4 Site Landfill

3.2.5 Neutrino Facility

3.3 When searches have been completed, advise Secondary Alarm Station personnel of the search status.

3.4 Lock down the Protected Area.

3.5 Notify the Water Reclamation Facility Control Room of the Assembly directive to ensure WRF personnel are notified to assemble.

3.6 Support the Emergency Coordinator with post-Assembly activities.

3.7 For Accountability, perform the following actions.

3.7.1 Ensure that the Emergency Coordinator receives a detailed Accountability report within 30 minutes following the request.

3.7.2 Using the Unit Evacuation System and/or the site-wide page, locate any unaccounted individuals identified on the detailed Accountability Report.

3.7.3 If necessary, coordinate with Fire Protection personnel to locate and assist unaccounted individuals identified on the detailed Accountability Report.

4.0 Assembly Area Supervision actions

4.1 Ensure assembling personnel each register their ACAD in the card reader.

4.2 If the ACAD card reader is inoperable, perform the following actions:

4.2.1 Direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms).

4.2.2 Collect all forms and transmit them by facsimile (FAX 2687) to Security supervision.

4.3 If essential personnel are dispatched from an Assembly Area prior to completion of Accountability, account for them via one of the following methods (preferred listed first):

4.3.1 Transmit a copy of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), by facsimile (FAX) to Security supervision.

4.3.2 Notify Security supervision by telephone (6470 / 6471 / 6472) of name and ACAD numbers for the appropriate individuals as listed on an Accountability Form.

4.4 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

Appendix J - Site Evacuation

1.0 General information

1.1 Although Site Evacuation is required at the General Emergency level, it is an option for the Emergency Coordinator to determine the need for and order a site evacuation of non-essential personnel at a less severe classification level. The Emergency Coordinator may also direct sheltering or an early dismissal of personnel prior to a danger of radiation exposure.

1.2 Personnel who are not identified as Emergency Response Organization staff members are considered non-essential. This excludes onsite and offsite assistance personnel who are currently engaged in emergency response activities in direct support of the Emergency Response Organization.

1.3 It is imperative that onsite organization efforts associated with the evacuation are completed prior to notification of all non-essential personnel by the Emergency Coordinator of the need to evacuate the site. Security personnel must be strategically located to effect an orderly evacuation. A disorderly evacuation could increase the potential for personal injury and site security efforts should be coordinated with local law enforcement agencies to lower this potential.

1.4 Buckeye Airport is the preferred reassembly area due to additional radiological support provided by the Arizona Radiation Regulatory Agency and additional security support provided by local law enforcement agencies.

2.0 Emergency Coordinator actions

2.1 After actions to organize the evacuation have been completed and security measures have been established, transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. Site evacuation for non-essential personnel is required. Proceed to your own vehicles and follow the instructions from Security."

2.1.1 Sound the Site Evacuation Signal for approximately 30 seconds.

2.1.2 Repeat the message once. This responsibility can be delegated.

3.0 Radiation Protection Monitor / Radiological Assessment Coordinator actions

3.1 Consult with the Security Director / Security Coordinator to determine the evacuation route and site egress point.

3.2 Designate one or more radiological monitoring team(s) who will go to the Reassembly Area at Buckeye Airport to provide monitoring of personnel and vehicles.

3.3 In conjunction with the Security Director / Security Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

3.3.1 After the briefing, direct the radiological monitoring team(s) to take the following actions:

3.3.1.1 Obtain a copy of EPIP-06, Reassembly Area Operations.

3.3.1.2 Obtain two to four friskers (RM-20).

3.3.1.3 Obtain one to two dose rate instruments.

3.3.1.4 Obtain one two-way radio.

3.3.1.5 Obtain the Reassembly Area key.

3.3.1.6 Proceed immediately to the Reassembly Area at the Buckeye Airport using the appropriate site egress and evacuation routes.

NOTE

EPIP-06, Reassembly Area Operations, is designed to prepare the Reassembly Area for use in accordance with the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure. It should be utilized only for the time period prior to the arrival of state officials. Thereafter, the State of Arizona Standard Operating Procedure will be used to direct Reassembly Area Operations.

3.3.1.7 Upon arrival at the Reassembly Area, implement EPIP-06, Reassembly Area Operations, and transition to the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure upon arrival of state officials.

4.0 Security Director / Security Coordinator actions

4.1 Consult with the Radiation Protection Monitor / Radiological Assessment Coordinator to determine the evacuation route and site egress point.

4.2 The Security Director will complete supplemental onsite notifications prior to the Site Evacuation.

4.3 Inform Security supervision of the site egress and evacuation routes selected. Direct Security supervision to take the following actions and to report when completed.

4.3.1 Instruct a Security Officer to perform the following actions:

4.3.1.1 Obtain the emergency equipment for a Site Evacuation from Security Headquarters.

4.3.1.2 Prepare a selected Security vehicle (Security Shift Van preferred) with the emergency equipment.

4.3.1.3 Assume a strategic location at the designated site egress point.

4.3.1.4 Report when in position at the egress point.

4.3.1.5 Advise the CAS / SAS of status upon arrival at the Reassembly Area.

4.3.2 As determined by existing radiological conditions, direct Members of the Security Force to establish security measures and traffic flow requirements using personnel appropriately.

4.3.3 Advise local law enforcement agencies of the designated site egress point, the selected evacuation route, and the destination.

4.3.4 Contact the Water Reclamation Facility Control Room at Extension [3007] and inform the WRF Shift Supervisor of the need to evacuate the site, the designated site egress point, and to direct his / her personnel to load their vehicles to capacity and form a single line behind the lead Security vehicle at the designated site egress point.

4.4 In conjunction with the Radiation Protection Monitor / Radiological Assessment Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

4.4.1 Direct the Reassembly Team Leader(s) to obtain emergency van key boxes for vans located in the Operations and North Annex parking lots from the Emergency Operations Facility Activation Room. The keys are to be dispensed only to those personnel requiring van keys.

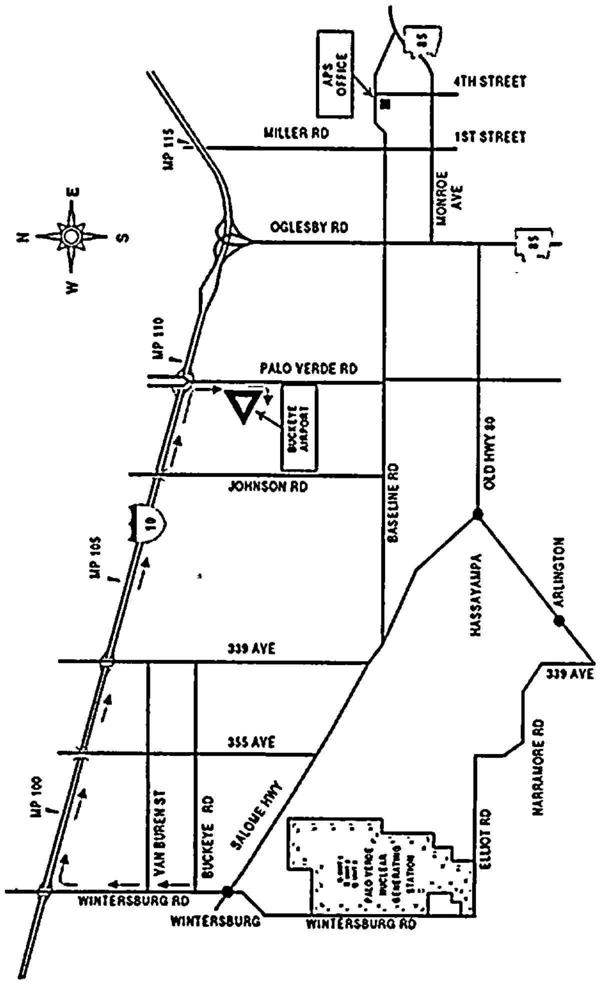
4.4.2 Direct the Reassembly Team Leader(s) to meet with the lead Security vehicle at the site egress point selected.

4.4.3 Direct the lead Security vehicle driver that when automobile and van drivers have formed a single line behind the lead Security vehicle at the designated site egress point, to proceed to the Buckeye Airport using the preselected evacuation route. Local law enforcement agencies will aid in the evacuation process, if required.

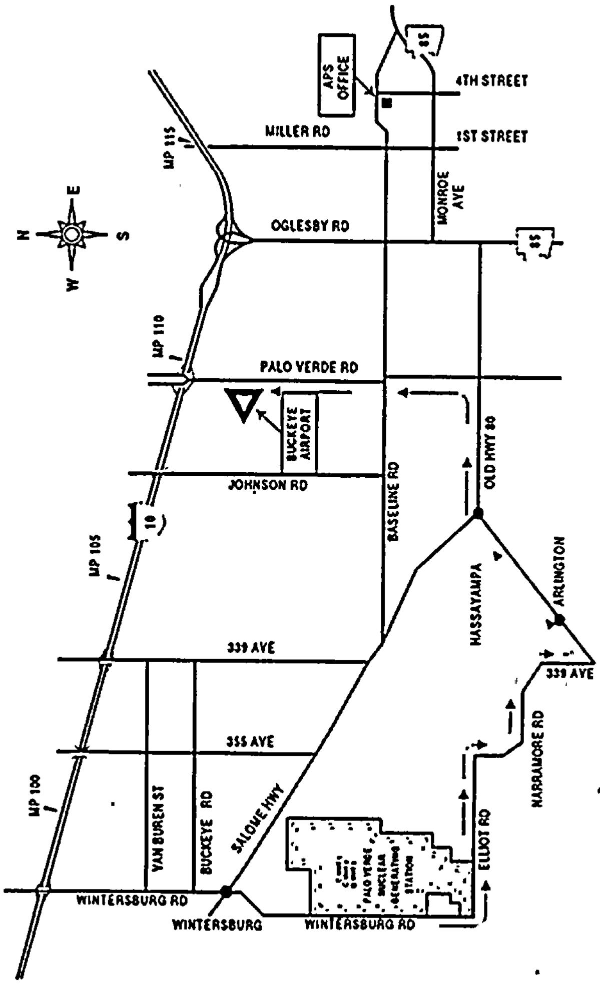
4.5 When the site has been evacuated, direct Security supervision to conduct searches of all buildings and areas outside the Protected Area for non-essential personnel.

5.0 Site Evacuation routes

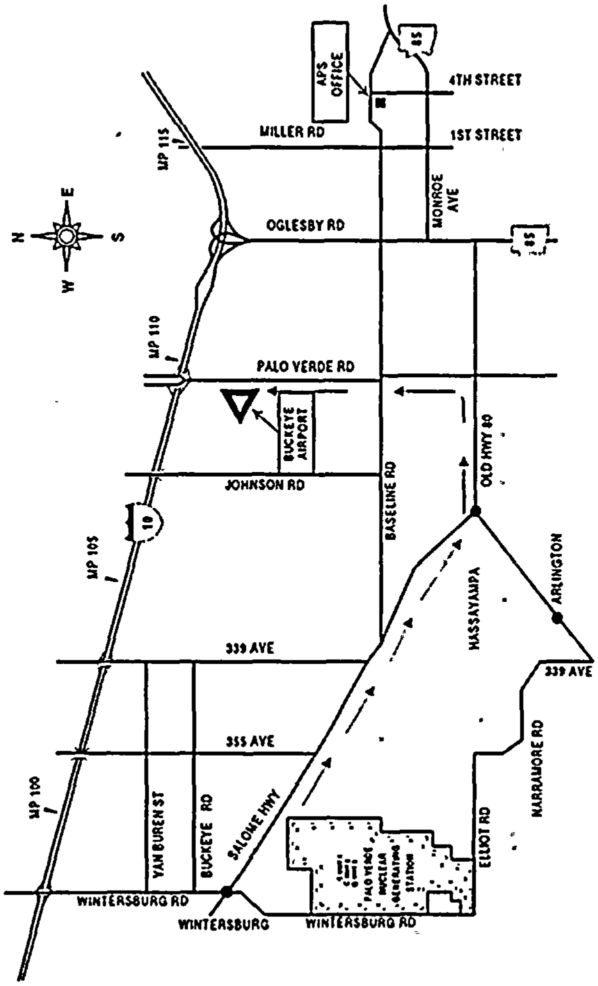
Site Evacution route #1



Site Evacuation route #2



Site Evacuation route #3



Appendix K - Emergency Exposures and KI

1.0 Introduction

1.1 Content

1.1.1 Planned Special Exposures, as defined in 10 CFR 20.1003 and 10 CFR 20.1206, are specifically excluded from guidance provided herein.

1.1.2 The instructions provided in this document assume that time is available for performing the appropriate sections. When circumstances dictate immediate actions, documentation associated with preliminary actions must be completed as soon as possible following those actions.

1.2 Noteworthy items

1.2.1 The Radiation Protection Monitor / Radiological Protection Coordinator shall advise the Emergency Coordinator on exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.2 The Emergency Coordinator shall authorize radiation exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.3 The Emergency Coordinator shall authorize use of Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM.

1.2.4 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be volunteers working under direct authorization of the Emergency Coordinator.

1.2.5 Emergency exposures associated with life-saving actions shall be limited to a single occurrence per lifetime.

1.2.6 Volunteers 45 years of age or older should receive primary consideration. When possible, the radiation exposure history of a volunteer should be researched and inspected prior to authorization. Minors are specifically excluded as volunteers.

1.2.7 Females shall not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

1.2.8 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be briefed, if time permits, on hazards and potential consequences prior to performing activities associated with that authorization. In cases when immediate actions are required, verbal authorization may be granted provided that all documentation associated with the authorization is completed as soon as possible following the actions. In all cases, subsequent dose extensions will not be granted prior to completion of evaluation documentation associated with preceding dose extensions.

1.2.9 Minimum documentation required for individuals authorized to receive dose not subject to the 10 CFR 20.1201(a) limits shall include an appropriate Radiation Exposure Permit and a completed Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms). Minimum authorizing documentation for use of KI shall be a completed Form EP-0503, KI Distribution (see Appendix C - Forms).

1.2.10 Administrative methods to minimize personnel exposure (ALARA) should remain in force to the extent consistent with timely rescue and corrective / protective actions per appropriate Radiation Protection Procedures.

1.2.11 Follow-up monitoring of individuals issued KI must be performed (whether or not exposure to radioiodine occurred) due to possible side effects associated with KI. In cases where radioiodine exposure has been confirmed, monitoring is required to maintain the thyroid blocking action by additional KI doses.

1.2.12 All dose received, including dose not subject to (beyond) 10 CFR 20.1201(a) occupational dose limits, will need to be subsequently documented in accordance with 10 CFR 20.2106.

1.2.13 Compliance with 10 CFR 20 during emergencies, including 10 CFR 20.1201(a) dose limits, shall occur as standard practice. Emergency related evolutions shall have a specific purpose involving high-priority actions necessary to save life, protect workers or the public, limit radiological release, or place the plant in a more secure condition relating to the emergency (protecting the plant).

1.3 Discussion

1.3.1 This document provides for personnel dose exposure control only under emergency conditions. For non-emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, should be used. During declared emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, remains applicable with the following provisions:

1.3.2 The current PVNGS Administrative Exposure Hold Point RRACS values established for site personnel will remain valid and the system will be used as a dose control tool for all activities in all Units and in all facilities.

1.3.3 The Radiation Protection Monitor, Radiological Protection Coordinator, or Radiological Assessment Coordinator may verbally authorize higher PVNGS Administrative Exposure Hold Points up to the 10 CFR 20.1201(a) limits for any particular emergency response team members. Use of Appendix A, Request for a Higher Administrative Hold Point, of Procedure 75AC-9RP01, Radiation Exposure and Access Control, during a declared emergency condition will not specifically be required.

1.3.4 Whereas the 10 CFR 20 limits apply to non-emergency conditions, every effort will be made to observe these limits under emergency conditions. They may be exceeded, if necessary, on a case-by-case basis, but only with advance authorization.

1.3.5 The Emergency Coordinator must authorize any dose beyond those limits specified in 10 CFR 20.1201(a) when the dose is projected to be in excess of any of those limits.

1.3.6 Emergency situations may include corrective / protective action circumstances where a high exposure to several individuals may greatly reduce exposure to many. A life-saving situation could also incur exposure approaching lethal levels when attempted. However, the vast majority of emergency response activity may be accomplished well within normal radiation dose controls.

1.3.7 Reflecting on this concept, the Environmental Protection Agency's (EPA's) guidance specifies that in the absence of special situations (e.g., life-saving, etc.), the 10 CFR 20 limits should be followed. An activity to protect valuable property is limited to 10 REM when a lower projected dose is not practicable. Life-saving activities on a voluntary basis have no upper limit established, but are not performed without the appropriate conditions applied.

1.3.8 Palo Verde Nuclear Generating Station has adopted this EPA guidance for emergency workers.

2.0 Emergency Exposure Dose Limits

2.1 Notes

2.1.1 The RPM / RPC may authorize doses up to the 10 CFR 20 limits - the EC must authorize doses beyond the 10 CFR 20 limits.

2.1.2 "Protecting Valuable Property" includes equipment-saving measures as well as sampling, surveillance, or repair activities that, in the opinion of the Emergency Coordinator, constitutes plant protective measures.

2.1.3 The exposure that workers incur for the protection of large populations may be considered justified for situations in which the collective dose avoided by the emergency operation(s) is significantly larger than that incurred by the workers involved.

2.2 Dose Limit Determination

2.2.1 Use the following chart to determine dose limits for which authorization of dose extensions may be required:

DOSE LIMITS	TEDE	TODE	LDE	SDE	AUTHORIZATION REQUIRED BY:
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM per year	50 REM * per year	15 REM per year	50 REM per year	RPM / RPC up to these limits EC to go beyond these limits
EPA Guidance for Protecting Valuable Property	10 REM per event	100 REM per event	30 REM per event	100 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations	≤25 REM per event	≤250 REM per event	≤75 REM per event	≤250 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM per event	> 250 REM per event	> 75 REM per event	> 250 REM per event	EC only *(and a risk discusion must be conducted)*

* Sum of Deep Dose Equivalent and Committed Dose Equivalent (DDE + CDE). EPA does not use TODE (Total Organ Dose Equivalent); EPA uses CDE in this column. PVNGS assesses TODE and, via this Instructional Guide and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

3.0 Thyroid CDE Risk Assessment

3.1 Outline

3.1.1 Use of this section assumes that conditions exist such that the probability for significant Iodine exposure is high. This section must initially be completed for each team and subsequently repeated for each team as conditions change. The sequence for radioiodine risk assessment will encompass the following actions:

1. Making a determination if the team's activity will be an Iodine concern
2. Determining Thyroid CDE dose rates for the team's work area
3. Performing a risk assessment for each team

3.2 Determining if Iodine is a concern.

3.2.1 Review internal plant conditions, component failure or leak areas, and external plume path conditions.

3.2.2 Instruct survey team(s) to obtain air samples in projected work areas and report the results of direct frisk readings on the particulate and Iodine media, in accordance with Form EP-0484, Air Sample Data (see Appendix C - Forms).

NOTE

The "µCi/cc" Iodine RMS channel indications on the RMS DCU or on ERFDADS cannot be used in the Field Sample Data Assessment for estimating Thyroid CDE rates. They represent accumulated, rather than current, airborne activity.

3.2.3 Review any alarming Radiation Monitoring System particulate, Iodine, and gas channels for indications of areas where other Iodine samples should be obtained.

3.2.4 For release path activity, collect appropriate particulate and Iodine samples, as necessary, from RMS Skids for counting on a multi-channel analyzer. If the sample volume is known, "µCi/cc" values may be obtained. Contact the Radiological Monitoring Technician as required.

3.3 Determining Thyroid CDE dose rates.

NOTE

A Thyroid CDE Dose Rate Estimate can be determined by using either the MESOREM printed report or field samples. The MESOREM printed report will provide recommendations to administer KI in affected sectors if the projected Thyroid CDE dose at the Site Boundary for the duration of the projected release time is > 25 REM. Additional Thyroid CDE dose rates will be provided for 2, 5, and 10-mile centerline distances. Field samples will provide more reliable data which can be used for the dose rate determination. For this reason, field samples are preferred when time is available.

3.3.1 For rate estimates using the MESOREM printed report, perform the following:

3.3.1.1 Review the 2, 5, and 10-mile Thyroid CDE dose rates and evaluate the dose where ARRA and RFAT Teams are expected to be operating. Since time is required for review and approval of data by the RAC, this process may not be applicable to the RPM.

3.3.1.2 For onsite receptors, review the "MAX" Thyroid CDE Dose Rate, which is calculated for a distance of 0.25 miles from the release point.

NOTE

The following applies to readings taken on Silver Zeolite (AgX) cartridges: On-scale frisker readings result in no requirement to administer KI. Full-scale frisker readings, i.e., 500,000 cpm, correlate to 1.6E-05 µCi/cc activity, which corresponds to slightly under 21 REM / hour. A frisker reading of 625 cpm correlates to the DAC limit of 2.0E-08 µCi/cc. On-scale RO-2 (closed window) readings of 3 mrem / hour at 1 hour into the event (after reactor scram) correlate to 6.0E-06 µCi/cc I131 equivalent, corresponding to approximately 8 REM Thyroid CDE / hour.

3.3.2 For rate estimates using field sample data, perform the following:

3.3.2.1 Obtain the I131 equivalent µCi/cc values from field team personnel. As time permits, obtain isotopic analysis results of the samples.

3.3.2.2 Direct the field teams to obtain additional samples needed to back-calculate and update dose projections until agreements in data are reached between projections and field samples. Data obtained via this process may be used for locations where no data is available.

3.3.2.3 Using the data obtained from onsite / offsite field samples, determine the Thyroid CDE dose / dose rates by multiplying the Iodine concentration from the Air Sample Data form (as reported by the field team) by 1.3E+06. The result is the equivalent Thyroid CDE dose rate in REM / hour. This calculation may also be executed on Form EP-0481, Air Sample Data (see Appendix C - Forms).

3.3.3 Determine the most accurate Thyroid CDE dose rate estimate from the review of all available data.

3.4 Performing a Team Risk.Assessment.

NOTE

This process requires frequent performance during an emergency event when workers may be exposed to Iodine activity. Log entries should be used as documentation for the ongoing review process. Assessments should be as accurate as possible without resulting in over-conservative measures.

3.4.1 Determine the estimated stay time for the individual / team in the Iodine environment.

3.4.2 Select the most appropriate Thyroid CDE dose rate per the available data for the Iodine environment which will be entered.

3.4.3 Multiply the Thyroid CDE dose / hour by the estimated stay-time (in hours) to derive the estimated dose without application of protection factors.

3.4.4 Determine applicable protection factors of the protective equipment that will be used.

3.4.5 If the protection factors can be used to compensate for protective equipment, correct the estimated dose for the appropriate protection factor.

NOTE

Risk from a thyroid dose > 25 REM CDE warrants dispensation of KI.

3.4.6 If the net estimated dose is clearly < 25 REM Thyroid CDE, no further action is required.

3.4.7 If the net estimated dose is near or > 25 REM Thyroid CDE, proceed to Section 5 of this document, Potassium Iodide Administration.

3.4.8 Ensure the individual / team is appropriately briefed per Section 6 of this document, Team Briefing and Deployment.

4.0 Emergency Exposure Authorization

4.1 Preparing the authorization.

NOTE

This section requires documentation based on a review of the radiological evaluation of the situation requiring potential emergency exposure.

4.1.1 Perform a radiological evaluation of the situation that requires potential emergency exposure.

4.1.2 When the radiological evaluation has been reviewed, retrieve Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

4.1.3 On Form EP-0300 (see Appendix C - Forms), the ORIGINATOR Section shall be completed by the RPM / RPC (or staff), adhering to the following guidelines:

4.1.3.1 Team personnel are volunteers working under direct authorization of the Emergency Coordinator.

4.1.3.2 Females will not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

4.1.3.3 Personnel have been made aware of potential hazards associated with exposure received under emergency conditions.

4.1.3.4 The individual current exposure status of each team member has been (will be) examined and is (will be) known.

4.1.3.5 Volunteers 45 years of age or older have been given primary consideration.

4.1.3.6 Emergency exposures associated with life-saving actions will be limited to a single occurrence per lifetime.

4.1.3.7 Team members consist of the most qualified individuals.

4.1.4 On Form EP-0300 (see Appendix C - Forms), indicate clearly in the "Reason for Request" area that an Emergency Classification has been declared and add the reason for team entry.

NOTE

On Form EP-0300 (see Appendix C - Forms), all signatures designate acceptance of the necessity to conduct a risk discussion, as time permits, with all workers authorized dose extensions for life-saving efforts, i.e., those pertaining to the lower two categories of the Emergency Exposure Dose Limit Chart in Section 2.2 of this Appendix. The review will encompass the risk review data from Section 6.1 of this Appendix.

4.1.5 The Radiation Worker shall sign on the appropriate line(s) in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms).

4.1.6 The RPM / RPC shall sign on the appropriate line in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms) and attach to the form any documentation of radiation surveys, etc. (if time permits) which were used for the radiological evaluation previously completed.

NOTE

The Emergency Coordinator has sole authority to approve radiation exposures beyond the 10 CFR 20 radiation exposure limits up to the Emergency Exposure Limits specified in Section 2.2 of this document.

4.1.7 If deemed appropriate, the Emergency Coordinator will approve (authorize) the request for the limit(s) desired per the Emergency Exposure Dose Limits specified in step 2.2 of this document.

4.1.8 The RPM / RPC shall follow up on emergency exposure for each individual per section 7.1.

5.0 Potassium Iodide Administration

5.1 Dispensation of KI.

NOTE

For the most effective utilization, KI should be administered at least one-half hour prior to anticipated Iodine exposure. However, KI will maintain substantial benefit even when taken three or four hours following acute Iodine exposure.

5.1.1 Obtain required approval for KI administration from the EC.

5.1.2 Ensure that the Emergency Exposure Authorization has been completed. TEDE and TODE limits and required approvals for exceeding dose limits must be established coincident with approval for the administration of KI.

5.1.3 Initiate documentation for each individual authorized KI administration by using one Form EP-0503, KI Distribution (see Appendix C - Forms), for each worker. Though not mandatory, record individuals' HPID Numbers and dates-of-birth on the forms.

5.1.4 If verbal approval is necessary, annotate "per telecon by (your name)" and sign the form as indicated.

5.1.5 Ensure a team briefing on the possible side-effects of Potassium Iodide, i.e., summarization of information on Form EP-0503 (see Appendix C - Forms), is conducted prior to the administration of KI to these individuals.

5.1.6 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one tablet to each individual authorized KI. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

5.1.7 The RPM / RPC shall follow up on KI administration for each individual per section 7.1.

6.0 Team Briefing and Deployment

6.1 Risk discussion criteria

6.1.1 Review the following information with all personnel who have been authorized emergency exposures in excess of 25 REM:

RISK REVIEW INFORMATION

Health Effects Associated with Whole Body Absorbed Dose Received Within a Few Hours	Whole Body Absorbed Dose *(RAD)*	Early Fatalities *(percent)* 2	Whole Body Absorbed Dose *(RAD)*	Prodromal Effects *(percent affected)* 3
(see EPA-400 Appendix B) 1	140	5	50	2
	200	15	100	15
	300	50	150	50
	400	85	200	85
	460	95	250	98

1 Risks will be lower for protracted exposure periods.
2 Supportive medical treatment may increase the dose at which these frequencies occur by approximately 50 percent.
3 Forewarning symptoms of more serious health effects associated with large doses of radiation.

Approximate Cancer Risk to Average Individuals from 25 REM Effective Dose Equivalent Delivered Promptly	Age at Exposure *(years)*	Approximate Risk of Premature Death *(deaths per 1000 persons exposed)*	Average Years of Life Lost if Premature Death Occurs *(years)*
(see EPA-400 Appendix C)	20 to 30	9.1	24
	30 to 40	7.2	19
	40 to 50	5.3	15
	50 to 60	3.5	11

Threshold Dose Levels for Acute Doses

	Effect	Threshold Organ Dose
The threshold effect is a concept for defining a minimum acute organ dose above which the described effect will *(not may)* occur in the exposed individual, although the occurrence may come later. It is not a risk estimate. It is a minimum level of detectability from a limited number of observations, so threshold values for humans are approximate values -- not absolute numbers.	Suppressed Sperm Coun	10 REM
	Damage to Fetus	10 REM *(but high risk of mental retardation requires use of a lower limit)*
	Thyroid Function Impaired	200 RAD
	Thyroid Made Hypothyroid	3,000 - 10,000 RAD
	Cataracts	500 - 1,200 RAD
	Skin Reddening	300 - 800 RAD
	Skin with Oozing Lesions	1,200 - 2,000 RAD

Organ systems are not expected to show symptoms of severe clinical pathophysiology for acute doses below a few hundred RAD. For additional information, see EPA-400 Appendix B.

6.2 Dispatching the team.

6.2.1 Inform the team leader(s) that dose authorization approvals are complete

6.2.2 Ensure that Radiation Protection personnel have a clear understanding on established dose limits and team entry abort points.

6.2.3 Dispatch the team.

NOTE

If the computerized dose tracking system (RRACS) is inoperable, dose records must be updated manually and annotated in the DOSIMETRY RECORD UPDATE Section of Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

6.3 Request the RPM / RPC / RAC to update RRACS. (This action may be completed during or after the entry). If Dosimetry personnel are not available, obtain the sealed "Emergency Dose Authorization Package" from an Operations Support Center Emergency Kit. Open the envelope and follow the instructions inside, using the supplied RRACS password to gain access to the system and update the hold point with the new authorized limit.

7.0 Subsequent Actions

7.1 Emergency exposure follow-up

7.1.1 Upon return of team members, collect all dosimetry for evaluation.

7.1.2 Ensure all team members are not deployed for further work until exposure evaluations have been completed.

7.1.3 Retrieve Appendix B, Record Exposure Evaluation, of Procedure 75RP-9ME23, Lost or Damaged Dosimetry, and initiate actions to complete the form.

7.1.4 Transmit all thermoluminescent dosimetry (TLDs) to Dosimetry for evaluation. Include information regarding which individuals require expedited dose reports.

7.1.5 During RRACS record update, ensure appropriate dose limits are reset to normal levels. Dosimetry personnel will complete the RECORDS UPDATE Section of the Record Exposure Evaluation Form.

7.1.6 Conduct a team debriefing at the conclusion of the job evolution and when exposure evaluations have been initiated.

7.1.7 Report any exposures authorized by the EC and received by team members to the Emergency Coordinator / Emergency Operations Director.

7.1.8 Ensure that the EC initiates actions to complete USNRC notifications of radiation exposures per 75AC-9RP04, Radiological Reports, if appropriate.

7.2 KI administration follow-up

NOTE

Performance of this section assumes personnel from Dosimetry, Medical, and Radiation Protection are available for support efforts.

7.2.1 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one (1) tablet to each individual authorized KI every 24-hours for three (3) days. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

7.2.2 Consult the Medical Department and determine if the need exists for extended KI administration periods by evaluating radiological exposures. In unusual circumstances, KI may be issued for a period of up to ten days. The Medical Department will provide KI dispensing instructions and will supervise KI administration.

7.2.3 Continue the monitoring of personnel for side-effects to KI and/or any radioiodine exposures that may have occurred.

7.2.4 When required documentation on each Form EP-0503, KI Distribution (see Appendix C - Forms), has been completed, forward the completed forms to Dosimetry. These forms become part of each individual's exposure history.

Appendix L - Accident Sampling

1.0 Introduction

1.1 Applicability

This Appendix is applicable to obtaining, handling, analyzing, and reporting samples pertaining to accident conditions in accordance with the requirements specified in NUREG-0654 and NUREG-0737. It provides the methodology for analysis of reactor coolant liquid, safety injection liquid, and Containment atmosphere samples. In addition, the document functions to provide instructions for RMS effluent sampling from the Plant Vent and Fuel Building Exhaust high range monitors for particulate and Iodine activity. Chemistry will usually be responsible for performance of this procedure with assistance from Operations and Radiation Protection personnel.

1.2 Prerequisites

Direction has been authorized and received for initiating the actions necessary to obtain accident sampling and analysis.

1.3 Precautions - general

1.3.1 Sampling activities require review of current and potential radiation and airborne activity to determine if actions associated with emergency exposures or issuance of KI need to be implemented.

1.3.2 When practical, the use of remote tools and shielding to minimize radiation exposure should be accomplished.

1.3.3 Monitoring for explosive atmospheres should be performed whenever plant, fuel, or sampling conditions indicate actual or potential elevated Hydrogen levels.

1.3.4 If possible, the sample should be counted in an Affected Unit laboratory. An Unaffected Unit laboratory should be prepared for analysis if conditions preclude counting in the Affected Unit laboratory.

1.3.5 Samples acquired during and after accident conditions should not be disposed of or destroyed without prior approval of the Chemistry Coordinator or the Emergency Coordinator.

1.4 Precautions - PASS inoperable

1.4.1 74DP-9CY02, Post-Accident Sampling System Program, provides direction for alternate sampling capability in the event that PASS becomes inoperable. Further direction is contained in 74OP-9SS05, Preplanned Alternate Sampling, which provides specific alternate sampling and collection methodology. The guidance in these procedures should be used in conjunction with this document for sample handling, control, and analysis.

1.4.2 When using the Preplanned Alternate Sampling methodology, dose rates and airborne activity will vary considerably, depending on plant conditions.

1.4.3 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, is based on using a PASS which is operable. The calculation assumes the CEDE dose to be negligible relative to the DDE.

1.4.4 Calculated data is not provided for specific Preplanned Sampling events beyond the data developed for PASS sampling for the following reasons:

1.4.4.1 In a Loss-of-Power (LOP) condition, the potential for localized airborne hot spots is high because ventilation / filtration will not be operating. The natural ventilation flows and flow paths resulting will be unpredictable.

1.4.4.2 Under abnormal plant conditions in which PASS is not operable, travel paths to and from sample areas, stay times in those areas, and plant conditions could vary widely from the projected calculated data comprising Section 9.0 of this document.

1.4.4.3 Use of supplied air, Self-contained Breathing Apparatus (SCBA), and/or other use of respiratory protection will most likely be required under accident conditions, as implementation of the procedure indicates significant plant conditions exist. The CEDE dose component may be crucial.

1.5 Precautions - RMS skid and sampling activity

1.5.1 Due to the potential for fluctuating area and release stack dose rates under accident conditions, the Chemistry and Radiological Monitoring Technician must maintain the Radiation Protection Monitor and Operations Support Center staff aware of their work areas and expected stay times to allow for dose control.

1.5.2 Dose rates and/or conditions may preclude accomplishing scheduled tasks. These conflicts should be brought to the attention of the Emergency Coordinator and Chemistry Coordinator for resolution.

1.6 Precautions for Chemistry Technician / Radiological Monitoring Technician

1.6.1 Sampling activities under emergency conditions prior to activation of onsite facilities will be authorized by the Onshift Organization - sampling activities under emergency conditions following activation of onsite facilities will be authorized by the Onsite Organization.

1.6.2 Prior to sampling work activities, all applicable technicians must sign the Emergency Radiation Exposure Permit and participate in a briefing conducted by Operations Support Center staff on current and expected conditions.

1.6.3 A working area telephone number should be provided to the Operations Support Center Coordinator and to the Chemistry Coordinator in the Technical Support Center. Available FAX machines may be utilized for additional communications with Technical Support Center staff.

1.6.4 During sampling activities, the Chemistry and/or Radiological Monitoring Technician should provide verbal updates to the Radiation Protection Technician, concentrating on actions which may cause a change in radiation levels.

1.6.5 Consider raising the alarm setpoints on RU-23, RU-26, and/or RU-158D commensurate with expected area dose rates. Consider isolating the taps on RU-9 and RU-10 to obtain representative sampling of a particular area, i.e., isolating RU-10 to monitor only the Chemistry Hot Lab area during sampling.

1.6.6 Verify the current operability of the sampling area ventilation system.

1.7 Precautions for Radiation Protection Technician

1.7.1 A determination must be made regarding protective equipment and area entry requirements prior to commencement of any sampling work. As soon as personnel are identified, extremity thermoluminescent dosimetry (TLD) packets should be prepared to avoid any delays in the sampling evolution.

1.7.2 Critical steps in the procedure should be reviewed with assigned personnel and expected stay times, sample exposure times, and critical areas should be determined. Expected exposures should be ascertained when reviewing available survey data, plant conditions, and RMS indications. Additional surveys should be obtained, if necessary. An RO-7 can be used to monitor dose rate changes in front of septum ports in extreme dose conditions.

1.7.3 Exposure limits, dose extensions, Potassium Iodide administration, and approvals can be obtained from the Radiation Protection Monitor / Radiological Protection Coordinator. If necessary, process additional exposure authorizations and/or KI distribution documentation (see Appendix K - Emergency Exposures and KI, and contact the RP Monitor for guidance). Ensure all documentation, including RRACS entries, are complete prior to proceeding with sampling evolutions.

1.7.4 A Radiation Exposure Permit should be prepared for all assigned sampling activities. Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), will aid in assurance that radiological controls and directions are established.

1.7.5 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, and the Briefing Guidelines in section 2.0 should be reviewed with all team members prior to dispatch.

1.7.6 Ensure that all samples collected are labeled, stored, and posted in accordance with 75RP-9RP15, Control and Storage of Radioactive Material.

1.8 Precautions - Chemistry Leader / Chemistry Coordinator

NOTE

The Chemistry Coordinator will function from the Technical Support Center following that facility's activation. Prior to activation, direction and/or recom-mendations may be obtained via telecommunications from an offsite Chemistry Leader if specific Chemistry information and/or direction is necessary.

1.8.1 The Chemistry Leader / Chemistry Coordinator should ensure that all personnel assigned duties regarding sampling and analysis are qualified and experienced on system operations.

1.8.2 In coordination with the Emergency Coordinator and Shift Technical Advisor / Reactor Analyst, the Chemistry Leader and/or Chemistry Coordinator should determine the samples required and the sampling priorities for current plant conditions. Consideration of and planning for RMS high range skid sampling options (3 P/I configurations are available), sampling per the Preplanned Alternate Sampling options, PASS sample options, and other RMS samples available should be included.

1.8.3 Analytical equipment required to analyze a post-accident sample should be prepared at an Alert, or higher, emergency classification, whether or not a post-accident sample has been requested. If radiation levels are prohibitive in the Affected Unit, preparations should be started in an Unaffected Unit.

1.8.4 Consideration should be given to allow at least 2 hours to elapse after a reactor trip prior to isolating a PASS RCS or Containment atmosphere sample:

1.8.4.1 2-hour decay could decrease local radiation levels by 2-2½ times

1.8.4.2 3-hour decay could decrease local radiation levels by up to 10 times

1.8.5 Containment and Auxiliary Building sump liquids may exhibit higher-than-normal radiation levels during accident conditions.

1.8.6 The Auxiliary Building sumps automatically pump to the TDS Tanks to prevent flooding and subsequent loss of the HPSI, LPSI, and CS Pumps. If RCS leakage to the Containment or Auxiliary Building sumps exists in conjunction with elevated RCS activity, monitoring and planning will be required for the extreme activity potential that can be transferred to the TDS Tank area outside of the Radwaste Building.

1.8.7 Safety Injection liquid samples can be used to estimate the Containment sump activity levels after a Recirculation Actuation Signal (RAS) has occurred or if the plant has been cooled down and Shutdown Cooling has been placed into service.

1.9 Precautions - Radiation Protection Monitor (RPM) / Radiological Protection Coordinator (RPC)

1.9.1 The RPM should direct, review, and monitor the actions of the Radiation Protection staff to ensure adequate pre-job surveys, REPs, and team briefings are provided for all sampling teams. The PASS Dose Information / Thumb Rules in section 9.0 and the Briefing Guidelines in section 2.0 of this Appendix should be used.

1.9.2 If exposures due to sampling activities are expected to approach or exceed those specified in 10 CFR 20.1201(a) or if high Iodine activity is potentially present, recommendations should be made to the Emergency Coordinator to implement guidance associated with Appendix K - Emergency Exposures and KI.

1.9.3 Communications between the Chemistry and Radiological Monitoring Technicians and the Operations staff should be maintained to ensure that changing plant conditions are understood and properly confirmed during all sampling activities. Any changes that occur to either monitored or unmonitored release pathways should be taken into account from an offsite perspective. Any changes that occur to onsite RCA boundaries due to internal and external dose limitations should also be considered as plant conditions change.

2.0 Sampling Briefing and Preparation

2.1 Briefing guidelines

The following Sampling Team Briefing Guidelines should be used when conducting the In-plant Team Briefing prior to sampling activities:

2.1.1 As a minimum, extremity dosimetry shall be placed on the middle finger of anyone handling sample tools or samples. Extremity dosimetry shall be utilized for Chemistry personnel working directly in front of septum ports on the Post-Accident Sampling System (PASS) or Radiological Monitoring (RM) Technicians collecting samples from Radiation Monitoring System (RMS) high range skids. Extremity dosimetry should be issued in accordance with site dosimetry procedures.

2.1.2 Due to the speed with which an accident sample is drawn, the RP Technician will probably not have sufficient time to collect an air sample and have it counted before the time at which the accident sample is drawn. Nor is there expected to be significant airborne activity released from the sample when using the PASS unit. Despite this assumption, an air sample should be prepared and run during the sampling activity to allow for the unexpected. RU-10 should be monitored constantly by the RM Technician. Preplanned Alternate Sampling activities will require additional actions based on implementation of section 7.0, Preplanned Alternate Sampling.

2.1.3 Proper labeling of samples with applicable times related to events will be crucial to the ongoing response to the emergency. All labeling activities should be performed from the long-term impact perspective. If extreme sample activity precludes labeling samples directly, the RP Technician shall ensure that outer postings are complete and that they provide direction for control of the samples.

2.1.4 The accident sampling team should thoroughly discuss each planned sample activity by stepping through this document and verbalizing the intent of each step and what is required to perform that step. Equipment should be verified available prior to starting actual sample collection. Plan for the unexpected; discuss what to do if a sample is dropped, a glass syringe breaks, etc. Any system breach will cause an immediate significant increase in Noble Gas activity.

2.1.5 The accident sampling team shall immediately inform the Operations Support Center Coordinator and the Chemistry Coordinator of significant problems or changes to the expected conditions as addressed in this briefing and on the REP.

2.1.6 The accident sampling team shall review the information comprising the PASS Dose Information / Thumb Rules in section 9.0 of this procedure, Sample Data Reference, prior to the start of sampling. All accident sampling team members shall also review current RMS indications. Preplanned Alternate Sampling teams shall employ continual RMS monitoring during all sampling evolutions.

2.1.7 When possible, use remote tools to handle high activity samples during sampling and analysis to provide maximum distance from the source. Maintain personnel exposures ALARA by observing all necessary precautions based on existing conditions.

2.1.8 The travel routes to and from the sample area should be reviewed to minimize dose. The route should be monitored for changes by OSC staff after an accident sampling team is dispatched.

2.1.9 Monitoring for an explosive atmosphere should be performed whenever plant / sampling / fuel conditions indicate elevated Hydrogen activity.

2.2 Preparing resources

NOTE

Emergency conditions may require immediate actions. If all actions outlined in the remainder of this Section cannot be completed prior to team dispatch, they may be completed in parallel with or as soon as possible following team dispatch.

2.2.1 When the team briefing has been completed and documented, ensure that all appropriate personnel data have been recorded on the applicable REP and have been entered into RRACS accordingly.

2.2.2 Ensure that all specified dosimetry and protective equipment has been issued.

2.2.3 Ensure that all RP pre-job surveys are complete and that preliminary postings are in place as required.

2.2.4 Ensure that the Chemistry, RP, and RM Technicians have each reviewed the actions in this document relative to critical hold points and that each has reviewed their planned sample survey and handling techniques in accordance with the Briefing Guidelines in section 2.0 and the PASS Dose Information / Thumb Rules specified in section 9.0 of this document.

2.2.5 Direct each accident sampling team member to perform an initial RMS review.

2.2.6 Instruct the RM Technician to monitor for unexpected changes on monitors near the sampling areas and near routes leading to and from the sampling areas.

NOTE

The choice of sampling method to be used is based on dose potential rather than on event categorization. Normal sampling systems may be employed under emergency conditions until or unless the dose potential mandates otherwise.

2.2.7 Based on sampling requirements, ensure that one of the following actions has occurred:

2.2.7.1 The Chemistry Technician has prepared either Chemistry Cart #1 or Chemistry Cart #2 for PASS sampling. Form EP-0051, Chemistry Cart #1 Preparation Checklist (see Appendix C - Forms), or Form EP-0052, Chemistry Cart #2 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.2 The Radiological Monitoring Technician has prepared Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.3 The Chemistry Technician has prepared equipment per the requirements specified in 74OP-9SS05, Preplanned Alternate Sampling (PASS is inoperable and PASP has been initiated.)

NOTE

Initially, two 1-inch attenuator blocks are used for the liquid and gas isotopic sample analyses. Initially, six 1-inch attenuator blocks are used for the particulate and Iodine sample analyses and the number of attenuator blocks are decreased, if necessary.

2.2.7.4 Verify that an efficiency calibration for necessary attenuators has been performed in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System, for each detector to be used. A PASS detector is any predefined detector which has been calibrated and verified using lead attenuators or collimators within 25% of certificate activity in accordance with 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.5 Verify that calibrations have been performed on the Multi-Channel Analyzer (MCA), Autotitrator, Ion Chromatograph, and Gas Chromatograph and that they meet the criteria specified in 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.6 If the Gas Chromatograph is to be used, ensure that the exhaust is directed to an operating vent fan.

3.0 PASS depressurized liquid sampling

3.1 Preparing for sample collection

3.1.1 Place the temporary syringe disposal shield inside the sample room.

3.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

NOTE

During sample recirculation, an increase in activity may be observed on RU-26, on RU-158 CH-4 (Chemistry Sample Room), and on RU-155 CH-3 (77' West Penetration Room). Samples in Units 2 and 3, with the exception of Containment atmosphere, recirculate coolant immediately from the 77' elevation West Penetration Room to the Chemistry Primary Sample Room. Containment atmosphere samples are first recirculated locally to the 77' elevation West Penetration Room and then are directed to the Chemistry Primary Sample Room in a recirculation phase. In Unit 1, all samples progress through local recirculation before they are directed to the Chemistry Primary Sample Room.

3.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Technician, and the OSC Coordinator that PASS is in sample recirculation.

3.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

3.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

3.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

3.1.6.1 Special concern should be placed on streaming from the septum ports, approximately 6 inches from the floor, and directly in front of the sample sink.

3.1.6.2 Ask the Chemistry Technician which septum port is appropriate prior to entering the sample room.

3.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing.

3.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document.

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 0.5 ml of sample.

Analysis to be Done	Volume Needed	IAW
Gamma Isotopic	0.1 ml	74CH-9XC50
B	0.3 ml	74CH-9ZZ06
Cl	0.1 ml	74CH-9ZZ72

3.1.6.5 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines.

- Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

3.1.6.6 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

3.1.6.7 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

3.1.6.8 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

3.2 Collecting the sample

NOTE

A 1-ml liquid syringe of primary coolant, collected 2 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 780 REM / minute contact, and will decrease to 80 REM / minute at 6 cm (2.4 inches).
The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

3.2.1 Using the equipment previously staged on Chemistry Carts #1 and #2, place a 3½-ml liquid vial into the 2-inch thick lead pig.

3.2.2 Position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

3.2.3 Using the remote tool, place the syringe into the liquid sample port guide tube assembly.

3.2.4 Quickly and carefully, withdraw the desired sample volume into the syringe.

3.2.5 Remove the syringe from the sample port and carefully dispense the entire volume into the 3½-ml vial contained in the lead pig.

3.2.6 Place the empty syringe into the temporary syringe disposal cask with the point of the needle down.

3.2.7 (The RP Technician shall) take the dose rate reading at the top of the vial prior to dilution. This reading will be used for subsequent dilution calculations.

3.2.8 Prepare one piece of parafilm measuring 2-inch by 2-inch. Do not remove the backing paper from the piece of parafilm.

3.2.9 Place the piece of parafilm with the backing paper facing down over the vial containing the sample.

3.2.10 Install and latch the lead pig lid and move to a low dose area, as required.

3.2.11 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0 of this document, Sample Transportation. Otherwise, continue in this Section.

3.2.12 Monitor the background dose from the cart when working on dilution activities for isotopic analysis to ensure that Chemistry Count Room operations are not affected.

3.2.13 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

3.2.14 Unlatch and remove the lid from the lead pig containing the sample.

3.2.15 Using two tongs approximately 10 inches long, remove the parafilm and paper backing from the top of the 3½-ml vial. Ensure that the vial is not pulled out of the lead pig by the parafilm.

3.2.16 Ensure that the sample vial remains within the shielded portion of the lead pig for the maximum possible time.

3.2.17 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

3.2.18 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

3.3 Preparing for sample analysis

3.3.1 Ensure that the modified lead brick containing three vials is on cart #1 with their vial lids removed.

3.3.2 Ensure that no other contributing dose rate source is on cart #1.

3.3.3 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

3.3.3.1 For Boron Analysis, go to section 3.4.

3.3.3.2 For Chloride Analysis, go to section 3.5.

3.3.3.3 For Gamma Isotopic Analysis, go to section 3.6.

3.3.3.4 For Oxygen Analysis, go to section 3.7.

3.3.4 Using a pipette, withdraw an appropriate volume of liquid for each analysis required from the sample vial contained in the lead pig.

3.4 Boron analysis

3.4.1 For Boron analysis, proceed to 74CH-9ZZ06, Boron Autotitrator Operation and Calibration, using an RP Technician to provide radiological controls and support coverage. Return to this step when completed.

3.4.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.5 Chloride analysis

3.5.1 For Chloride analysis, proceed to 74CH-9ZZ72, Operation and Calibration of the Ion Chromatograph, using an RP Technician to provide radiological controls and support coverage. (Return to this step when completed.)

3.5.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.6 Gamma isotopic analysis

3.6.1 Dispense each volume of sample into one of the 7-ml vials contained in the modified 3-stage lead brick. Identify each vial if more than one is to be used.

3.6.2 Move cart #2 to an area away from cart #1 to minimize the dose rate. Relocate cart #2 to an area which will not affect Count Room operations.

3.6.3 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

3.6.4 Using the following equation, calculate activity (A):

$$A = (RV/G) \times 1000$$

where:

A = total sample activity in mCi (milliCuries)

R = sample dose rate reading at the top of the vial in R/hr (obtained by RP Technician in the preceding step)

V = sample volume in ml (normally 0.1 ml)

G = applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0 of this document, Sample Data Reference

1000 = conversion factor from Ci to mCi

Calculated activity: ______________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

3.6.5 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

3.6.6 After using pipettes to transfer the desired sample volume from one vial to another, use a 10-ml (B-D) syringe with a 1½-inch needle to dilute the sample to a total volume of 7 ml with D.I. water.

3.6.7 When the final dilution is complete, replace the screw cap on the vial to be counted and wrap the vial with parafilm, plastic wrap, or a plastic bag.

3.6.8 Prepare and attach clear identification information to the sample vial.

3.6.9 If dilutions were completed for the remaining dilution vials, cap them and attach clear identification information to them.

3.6.10 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

3.6.11 (The RP Technician will) record the dose rate reading(s) on a survey map and post / label the sample accordingly.

3.6.12 (The Chemistry Technician should) review the planned movement and use of the sample to allow the RP Technician to prepare the necessary area postings and contamination controls.

3.6.13 Place the 7-ml sample vial to be counted into a 1-inch lead carrying case and carry the sample to the sample counting room.

3.6.14 (The RP Technician will) post the Count Room area and prepare contamination controls as sample activity warrants.

3.6.15 (The Chemistry Technician should) review planned activities / work.

3.6.16 Using two 1-inch attenuator blocks for liquid isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per the PASS Liquid Sample Dilution Requirements in Section 9 of this document, Sample Data Reference.

3.6.17 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

3.6.18 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

3.6.19 Proceed to section 6.0, sample analysis follow-up.

3.7 Oxygen analysis

NOTE

Dissolved Oxygen for post-accident conditions will be determined by calculating the amount of Oxygen introduced into the system from either the borated water source (RWT) or the Containment atmosphere. Any Oxygen depletion due to Hydrogen scavenging or other means will be ignored. Henry's Law Constants were taken from EPRI, PWR Primary Water Chemistry Guidelines, Revision 2, and Lange's Handbook of Chemistry, 12th Edition. Oxygen (cc/kg) is converted to Oxygen (ppm) in the ratio: ppm (0.7) = cc/kg.

3.7.1 For Small Break LOCA (pre-RAS), perform the following:

Determine RCS Oxygen concentration (Cf) using the following equation:

$$Cf = \left[\frac{\left[\frac{(Prwt) \times 0.209 \times 1.43}{H}\right] \times [Vrwt] \times CI \times VI}{Vf}\right]$$

where:

Cf = Final RCS oxygen concentration, ppm

Prwt = RWT pressure, psia

0.209 = Conversion factor for partial pressure of oxygen exerted on RWT (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

Vrwt = Volume of RWT added to system, gallons

CI = Initial concentration of RCS Oxygen, ppm

VI = Initial volume of RCS, gallons (maximum RCS volume = 100,000 gallons)

Vf = Final combined volume, gallons (maximum RCS volume = 100,000 gallons)

H = Henry's Law Constant, kg-psia/cc (from table below)

RWT Temperature (ºF)	kg-psia / cc
Trwt = 75	0.51
Trwt = 100	0.62
Trwt = 150	0.78
Trwt = 200	0.86

3.7.2 For Large Break LOCA (RAS), perform the following:

Determine RCS Oxygen concentration using the following equation:

$$\text{Crcs} = \left[\frac{\text{Pctmt} \times 0.209 \times 1.43}{\text{H}}\right]$$

where:

Crcs = Concentration of Oxygen in RCS (ppm)

Pctmt = Containment pressure, psia

0.209 = Conversion factor for partial pressure of Oxygen in Containment (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

H = Henry's Law Constant, kg-psia/cc (from table below)

RCS Temperature (ºF)	kg-psia / cc
T_{RCS} = 75	0.51
T_{RCS} = 100	0.62
T_{RCS} = 150	0.78
T_{RCS} = 200	0.86

4.0 PASS pressurized liquid (gas) / containment air sampling

4.1 Preparing for Sample Collection

4.1.1 Place the temporary syringe disposal shield inside the sample room.

4.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

4.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Tech-nician, and the OSC Coordinator that PASS is in sample recirculation.

4.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

4.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

4.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

4.1.6.1 Special concern should be placed on streaming from the septum ports located at the front of the sample sink approximately 6 inches from the floor and at the left side of the sample sink approximately 18 inches from the floor.

4.1.6.2 Ask the Chemistry Technician which septum port is appropriate for the intended sample prior to entering the sample room

4.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing

4.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 2 samples.

Analysis to be Done	Volume Needed
H2 / O2	0.5 cc
Gamma Isotopic	0.1 cc

4.1.7 (The Chemistry Technician shall) inform the RP Technician of the number and volume of samples required.

4.1.8 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines. Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

4.1.9 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

4.1.10 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

4.1.11 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

4.2 Collecting the sample

CAUTION

- A 0.5 cc syringe of RCS gas, collected 3 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 330 REM / minute contact, and will decrease to 27 REM / minute at 6 cm (2.4 inches). The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

4.2.1 With the equipment previously staged on Chemistry Carts #1 and #2, position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

4.2.2 Insert the gas-tight syringe into the handling tool and adjust the tool to withdraw the desired amount.

4.2.3 Using the syringe handling tool, place the syringe into the port guide tube assembly and withdraw the desired sample volume into the syringe.

4.2.4 (The Chemistry Technician will) place the syringe handling tool containing the syringe on the sample cart and then retreat to a designated low dose area.

4.2.5 (The RP Technician shall) take the dose rate reading on the syringe to establish initial working conditions.

4.2.6 If the sample is to be transferred to an Unaffected Unit, (the Chemistry Technician will) lock the syringe using the remote syringe locking tool.

4.2.7 (The Chemistry Technician will) place the syringe handling tool containing the syringe in the syringe carrying case.

4.2.8 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

4.2.9 Relocate the sample cart with the sample to an area of known background readings for the required analysis. Ensure that the area selected will not affect Count Room operations due to an unshielded source.

4.2.10 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

4.2.11 Ensure that the sample remains shielded for the maximum possible time.

4.2.12 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

4.2.13 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

4.3 Preparing for sample analysis

4.3.1 Ensure that all analyses activities are performed in accordance with Chemistry procedures and that the RP Technician is available to provide radiological controls and coverage.

4.3.2 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

4.3.2.1 For Hydrogen and Oxygen Analyses, go to section 4.4.

4.3.2.2 For Gamma Isotopic Analysis, go to section 4.5.

4.4 Hydrogen and Oxygen analyses

4.4.1 For Hydrogen and Oxygen analyses, transport 0.5 cc of sample to the gas chromatograph and analyze the sample in accordance with 74CH-9XC40, Operation and Calibration of the Hewlett Packard Gas Chromatograph. Return to this step when completed.

4.4.2 Proceed to section 6.0, sample analysis follow-up.

4.5 Gamma Isotopic analysis

4.5.1 For Gamma Isotopic analysis, transport 0.1 cc of sample to the sample preparation area and dispense the sample volume into a 9.2 cc gas vial (the vial previously evacuated 0.1 cc) contained in the modified lead bricks. The sample is now shielded.

4.5.2 Dispose of the syringe into the syringe disposal cask, needle down.

4.5.3 Move cart #2 to an area away from cart #1 to minimize the working dose.

4.5.4 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

4.5.5 Using the following equation, calculate activity (A):

$$A = (RV / G) \times 1000$$

where:

A = Total sample activity in mCi (milliCuries)

R = Sample dose rate reading at the top of the vial in REM/hr (obtained by RP Technician in the preceding step)

V = Sample volume in ml (normally 0.1 ml)

G = Applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0, Sample Data Reference

1000 = Conversion factor from Ci to mCi

Calculated activity: ______________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

4.5.6 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

4.5.7 Perform the appropriate dilution by evacuating the specified amount from a clean 9.2 cc gas vial and injecting the sample.

4.5.8 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

4.5.9 (The RP Technician will) record the dose rate reading(s) and post / label the sample accordingly.

4.5.10 Place the final sample into a 1-inch shield and transport the sample to the sample counting room.

4.5.11 Using two 1-inch attenuator blocks for gas isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per section 9.0 of this document, Sample Data Reference.

4.5.12 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

4.5.13 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

4.5.14 Proceed to section 6.0 in this document, Sample Analysis Follow-up.

5.0 RU-144 / RU-146 High Range sampling

5.1 Preparing resources

5.1.1 "Mn" is the designator used for a Bechtel RU monitor number (e.g., Monitor-30 correlates to RU-144, Monitor-49 correlates to RU-146). "C" is the designator for the Channel Number or sample chamber, as appropriate.

5.1.2 RU-144 / RU-146 have two particulate / Iodine continuous (default) collection chambers and a third grab sample chamber, which has precisely timed collection capabilities. These are identified as 1, 2, and 3 from left to right when facing the chamber collection trays. The timed grab sample chamber is #3.

5.1.3 2 sample choices exist:

5.1.3.1 Either one of the two continuous channels may be collected after placing the alternate channel into operation, or...

5.1.3.2 A timed grab sample may be taken (low volume) in conditions of high Iodine activity

5.1.4 The instructions in this Section should be performed by the Radiological Monitoring Technician and pertain only to RU-144 and RU-146 particulate and Iodine samples. All other samples should be obtained in accordance with 74RM-9EF60, RMS Sample Collection.

5.1.5 Access to either monitor requires established radio communications with Technical Support Center personnel or with those designated per the team briefing. The RP Technician shall ensure that radio communications are maintained.

CAUTION

Exposure rates may be extremely high when attempting to obtain samples from an effluent monitor under accident conditions - both at the skid and enroute. All ingress / egress paths should be evaluated to minimize potential dose. The instructions herein may be performed out-of-sequence for ALARA considerations. Sample dose rates will be dependent on sample flow rates and Iodine activity levels. Form EP-0055, RMS Skid Collection Time Calculation (see Appendix C - Forms), may be used to determine the collection time in high Iodine activity situations to maintain sample dose rates below the 0.25 Ci sample counting limit.

5.1.6 (The RP Technician shall) ensure that the Radiological Protection Coordinator (RPC) in the Technical Support Center (TSC), or designee, will monitor plant and RMS conditions and provide them to the sampling team via radio, as appropriate.

5.1.7 Use Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as required, to log information accumulated during performance of these instructions.

NOTE

The filter head, a stainless steel head specifically designed for the RMS, and the required sample handling tools / tongs, are located in the OSC Emergency Kit.

5.1.8 Prepare all equipment associated with Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

5.1.9 If RU-146 sampling is to be performed, ensure that a bucket with at least 50' of rope is included with the equipment.

5.1.10 Load the filter head with a Silver Zeolite (AgX) Cartridge and particulate filter.

5.1.11 Determine the sample to prepare and proceed to the appropriate sample preparation block per the following:

5.1.11.1 To prepare a continuous collection sample from RU-144, go to section 5.2.

5.1.11.2 To prepare a timed grab sample from RU-144, go to section 5.3.

5.1.11.3 To prepare a continuous collection sample from RU-146, go to section 5.4.

5.1.11.4 To prepare a timed grab sample from RU-146, go to section 5.5.

5.2 RU-144 Continuous Collection Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.2.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.2.2 Change the sample chamber by first placing the DCU into "Privileged" Mode and then typing DCC 30 3 (1 or 2) and pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 15 (1 or 2) ENT.)

5.2.3 Proceed to section 5.6.

5.3 RU-144 Timed Grab Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are reestablished with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.3.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.3.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.3.3 Set the grab sample duration by first typing GSD 30 3 (sample duration in seconds) and then pressing <RETURN>. [Example: 90 seconds is entered as "9.00 01 ENT"] (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 16 (sample duration in seconds) ENT. Verify by typing DSP 3 16 ENT.)

5.3.4 Initiate the grab sample by first typing IGS 30 3 and then pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter FTN 3 02 ENT.)

5.3.5 Allow sample collection to complete before continuing. The RP Technician can use this time period to establish a Cold Area for the team.

5.3.6 Proceed to section 5.6.

5.4 RU-146 Continuous Collection Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.4.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. (At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.)

5.4.2 Change the sample chamber by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 15 (1 or 2) ENT.

5.4.3 Proceed to section 5.6.

5.5 RU-146 Timed Grab Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.5.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.5.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.5.3 Set the grab sample duration by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 16 (sample duration in seconds) ENT. [Example: 90 seconds is entered as "9.00 01 ENT"]. Verify by typing DSP 3 16 ENT.

5.5.4 Initiate the grab sample by first placing the keyswitch in "ENABLE/LOCAL" and then entering FTN 3 02 ENT.

5.5.5 Allow sample collection to complete before continuing. (The RP Tech-nician can use this time period to establish a Cold Area for the team.)

5.5.6 Proceed to section 5.6.

5.6 High Range Collection

NOTE

RMS skid sampling may require passage through and/or working in general areas accompanied by high and varying dose rates. Constant attention must be given to background dose rates and expected high dose rates from the sample media. The travel route employed and sampling activities performed by Chemistry and RP should be acted and talked through prior to the actual sampling evolution.

5.6.1 With the necessary equipment, proceed to the monitor location.

5.6.2 Taking along that which is required, proceed to the monitor. If on location at RU-146, leave the lead pig with the lid open on the 140' elevation directly below the point from which the sample will be lowered. Carry the latch handle, handling tool, bucket, rope, and new filter head up the stairs to the monitor.

5.6.3 (The RP Technician shall) verify working dose rates at the monitor.

5.6.4 Ensure that the transfer pig lid is open and that the transfer pig is positioned for smooth and quick transfer of the sample. If on location at RU-146, tie one end of the rope to the bucket handle and the other end to the railing. Ensure that samples can be lowered without impairment.

5.6.5 Prior to isolating the sample flow valves, check the position of the solenoid valves to ensure that the channel has been isolated. The lamp above the active collection channel will be illuminated.

5.6.6 Close the inlet and outlet sample flow valves of the particulate / Iodine channel(s) as directed in the team briefing per the following chart:

P/I Chamber #1		P/I Chamber #2		P/I Chamber #3	
IN	OUT	IN	OUT	IN	OUT
HCV-02	HCV-05	HCV-03	HCV-06	HCV-04	HCV-07

5.6.7 Open the shielded door by raising the latch.

5.6.8 (The RP Technician should) measure the dose rate on the P/I holder. If the dose rate exceeds the contact reading [REM / hr] as specified in the team briefing, the shield door should be closed and the sample left to decay prior to removal.

5.6.9 Insert the latch handle tool over the sample assembly lever and turn it counter-clockwise to release the spring tension. (This step can be performed manually as dose rates permit.)

5.6.10 Remove the Iodine and particulate sample filter head from the assembly quickly and carefully using tongs or manually as dose rates permit.

5.6.11 (The RP Technician should) obtain 1-foot dose rate readings on the sample filter head.

5.6.12 Place the sample filter head in the lead transfer pig and replace the lid. If on location at RU-146, place the sample filter head in the bucket and lower it to the 140' elevation at the pig.

5.6.13 Place the new filter head in the monitor sample assembly.

5.6.14 Turn the lever on the sample assembly clockwise using the latch handle or manually as dose rates permit.

5.6.15 Close and latch the shielded door and open the appropriate inlet and outlet valves previously closed.

5.6.16 Obtain total flow values.

5.6.17 If necessary, use the RMS key to place the microprocessor in "Local" or "Enable" Mode.

5.6.18 At the microprocessor, enter DSP C 37 ENT to display total flow in cubic feet, where "C" refers to 3 for continuous grab sample chamber #1, 4 for continuous grab sample chamber #2, or 5 for the timed grab sample chamber.

5.6.19 Record this value on Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as appropriate.

5.6.20 Step the filter and zero the flow totalizer and timer by performing the following actions:

5.6.20.1 Enter STP C ENT to step the filter. Use the number previously entered as "C."

5.6.20.2 Verify that the totalizer has been re-zeroed by entering DSP C 37 ENT. Use the number previously entered as "C."

5.6.21 Return the microprocessor to "Remote" or "Disable" Mode.

5.6.22 Press the "TEST-LT CK" Button to ensure that microprocessor communications are restored.

5.6.23 (If on location at RU-146, return to the 140' elevation and place the sample filter head in the transfer pig and replace the lid.)

5.6.24 (The RP Technician will) contact the OSC Coordinator and (the Radiological Monitoring Technician will) contact the Chemistry Coordinator and relay that the filters have been changed.

5.6.25 Deliver the sample to the appropriate Counting Room.

5.6.26 (The RP Technician will) label and shield (or store), as designated, the sample to minimize background activity.

5.6.27 (The Radiological Monitoring Technician will) ensure that all necessary data is attached.

5.6.28 If the sample is to be transferred to an Unaffected Unit for counting, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

5.7 High Range Skid Sample Analysis

CAUTION

Contact dose rate readings on the particulate and Iodine assembly may be greater than 9.0 REM / hour. Maintain adequate distances, minimize time periods in proximity, and maximize the use of shielding to ensure that personnel doses during sample analyses are maintained ALARA.

5.7.1 Using the P/I radiation level at a distance of 1 foot from the P/I cartridge, (readings obtained previously or at this time with the pig lid removed), determine the best method to obtain an estimate of isotopic Iodine levels.

NOTE

Counting systems in the laboratory are restricted to approximately 0.25 Ci in the sample due to avalanche and Compton scatter of the sample.

5.7.2 If dose rates are > 0.8 REM / hour, perform the following actions:

5.7.2.1 Using section 9.0, Sample Data Reference, RMS P/I Dose Rate - Curie Conversion Factors, obtain the appropriate net dose rate Curie conversion factors for I131 through I135, according to the time elapsed from the time of the accident to the time of the sample.

5.7.2.2 Calculate the estimated Curie content using the following formula:

AI = R X G

where:

AI = Individual isotopic activity in Curies

R = Unshielded sample dose rate reading at 1 foot in REM / hour

G = Individual isotopic conversion factor for I131 through I135 from RMS P/I Dose Rate - Curie Conversion Factors in section 9.0, Sample Data Reference

5.7.2.3 Calculate the effluent Iodine concentrations using the following formula:

$$Ci = \frac{35.3 \times Ai}{V \times 0.04}$$

where:

Ci = Iodine concentration of isotope "I," µCi/cc

V = Sample volume, cubic feet

35.3 = Conversion factor, µCi - ft3 / Ci - cc

0.04 = Plate-out correction factor for RU-144 / RU-146 skid samples

5.7.2.4 Calculate the total Iodine concentration by summing the isotopic concentrations.

5.7.2.5 Proceed to section 6.0, Sample Analysis Follow-up.

5.7.3 If dose rates are less than or equal to 0.8 REM / hour, perform the following actions:

5.7.3.1 Using six 1-inch attenuator blocks initially, carefully and quickly place the sample filter head assembly in the lead shield in the sample holder rack at the highest elevation centered directly over the appropriate attenuator block. Remove blocks as necessary.

5.7.3.2 Perform sample analysis in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System. Multiply the sample volume by 0.04 Iodine plate-out correction factor.

5.7.3.3 Remove the sample from the lead shield quickly and carefully using tongs and place the sample in a lead cask / pig.

5.7.3.4 Proceed to section 6.0, Sample Analysis Follow-up.

6.0 Sample analysis follow-up

6.1 Control of Analyzed Samples

NOTE

Form EP-0514, Containment Radiochemistry CDA (Parts 1-11 - see Appendix C - Forms) can be used to facilitate transmittal of data to the Technical Support Center.

6.2 Report analytical results to the Chemistry Coordinator upon completion of sample analysis.

NOTE

As appropriate, it is recommended that the Boron sample be discarded to the Chemical Drain Tank to minimize handling of diluted and contaminated samples.

6.3 (The Chemistry Coordinator will) designate which samples are to be saved and which are to be discarded.

6.4 Analyzed samples designated to be saved shall be dose rated, labeled, and shielded (or stored) as specified by the RP Technician to minimize background activity.

7.0 Preplanned Alternate Sampling

CAUTION

Significant exposure potential exists for the steps in this Section if performed under fuel failure conditions. The PASS should be used in all such conditions, if available. Team briefing and preparation must be planned with additional detail under fuel failure conditions in accordance with the guidance in this Section.

The loss of the PASS unit will remove the built-in sample and recirculation path shielding provided by that system and the built-in control of airborne (gas) leakage.

Section 9.0, Sample Data Reference, PASS Dose Information / Thumb Rules, applies to use of the PASS unit only. Use of the alternate sampling path under failed fuel conditions implies operating under worst-case conditions. It is imperative that actions are based on those conditions rather than assumptions because of the potential for lethal dose areas to exist.

Dose rates in the primary sample sink area will mandate stay time controls for worst-case situations. It will be crucial to involve the RM Technician to provide full-time monitoring of RMS indications (dose rates and airborne levels) to assist the PASS team.

Airborne problems are minimized using PASS, but have the potential to be extreme when using the Preplanned Alternate Sampling methodology. Breathing protection (SCBA or supplied air) should, therefore, be used if practicable.

Analysis in the Affected Unit is highly doubtful when using the Preplanned Alternate Sampling methodology. Another Unaffected Unit laboratory should be prepared for sample analysis.

7.1 Review both Section 3.6 (specific information applicable to preplanned alternate sampling conditions and assumptions) and Appendices A and B of 74DP-9CY02, Post Accident Sampling Program.

7.2 Review Section 3 of 74OP-9SS05, Preplanned Alternate Sampling.

7.3 Clarify the planned sequence of actions with the sampling team and how these actions integrate with this procedure -- an example follows:

PASS is inoperable and an RCS liquid sample must be collected from the primary sample sink. The team would use part of Section 4 of 74OP-9SS05, Preplanned Alternate Sampling, to obtain a sample. They would then implement this procedure and perform Section 3.3, PASS Depressurized Liquid Sampling - Sample Analysis. (All actions should be acted and talked through during the briefing to ensure that a workable sequence of actions has been thoroughly formulated.)

7.4 Ensure all applicable actions relative to Appendix K - Emergency Exposures and KI have been addressed for the sample team.

7.5 Review the plant conditions with the sample team and the potential for fuel failure and its impacts.

7.6 Obtain the sample and analyze accordingly per the guidance disseminated in the team briefing.

8.0 Sample transportation

NOTE

Using the lead pig transfer rod, two individuals will be required to transport the lead pig containing the sample to an Unaffected Unit. The transfer rod should allow a 3-foot distance between each individual and the lead pig.

8.1 Onsite sample movement

8.1.1 (The RP Technician will) ensure that the sample is radiologically labeled and packaged, as appropriate, prior to transfer.

8.1.2 (The Chemistry Technician and Chemistry Coordinator will) determine the location to which the sample will be transferred.

8.1.3 (The Radiological Protection Coordinator and the RP Technician shall) determine the route based on current site conditions.

8.1.4 An Emergency REP and a team briefing shall be prepared, with all participating group personnel signed onto the REP prior to start of sample movement.

8.1.5 Advise the Security Director of the planned route of passage for Security escort and for the clearing of passageways in the receiving Unit, if appropriate.

8.1.6 Obtain an appropriate vehicle for transportation between Units as the activity and plant conditions warrant.

8.1.7 Prior to transfer, transmit copies of all applicable RP survey data and Chemistry information for the sample to the receiving Unit's RP and Chemistry Departments.

8.1.8 Prior to transfer, obtain acknowledgement of sample receipt preparations from the appropriate receiving Unit's department personnel.

8.1.9 Transfer the sample using planned resources, as necessary.

8.1.10 (Receiving Unit personnel will) assume continuation of performance in this procedure upon receipt of the transferred sample.

8.2 Offsite sample shipping

8.2.1 Labeling and shipping of samples will be performed by site personnel who are trained and qualified on applicable procedures in accordance with current site radwaste shipping and handling requirements.

9.0 Sample data reference

9.1 This information is based on PVNGS Calculation 03-NC-SS-A01, PASS Doses. The calculation is for a LOCA worst-case analysis and is based on the following assumptions:

9.1.1 Sampling is performed in the Affected Unit using the PASS.

9.1.2 Analysis is performed in an Unaffected Unit.

9.1.3 Dose traveling to and from the Affected Unit is not included (~2 REM TEDE).

9.1.4 Use is made of remote handling tools.

9.1.5 Source term data is from Bechtel Calculation 13-NC-CH-304, Post LOCA Sample Doses.

9.1.6 Airborne dose rates from Bechtel Calculation 13-NC-ZA-322, Post LOCA Airborne Dose for PASS, are negligible.

9.1.7 Dose given is for normal ventilation operable and for loss of power conditions (i.e., loss of ventilation).

9.1.8 Extremity dose "EX" is SDE to the extremities.

Dose in REM	RCS Liquid	RCS Gas	CTMT Air	RCS Liquid w/ LOP	RCS Gas w/ LOP	CTMT Air w/ LOP
Preparation	0.36 DDE	0.37 DDE	0.37 DDE	1.32 DDE	1.75 DDE	1.53 DDE
Sampling	0.12 DDE	0.10 DDE	0.09 DDE	0.80 DDE	0.66 DDE	0.47 DDE
Dilutions	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX
Analysis	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX
TOTALS	0.53 DDE	0.47 DDE	0.46 DDE	2.20 DDE	2.40 DDE	2.00 DDE

Sample Type	Sample Quantity (cc or ml)	mrem / Hour @ 18"
RCS Liquid	0.1	425
	0.3	1270
	0.8	3400
RCS Gas	0.1	68
	0.5	340
Containment Atmosphere	0.1	2
	0.5	9

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

RCS LIQUID SUMMARY

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
0	450	1.5720	286.9
1	290	1.1723	248.9
4	150	0.8106	188.0
8	105	0.6441	163.4
12	84	0.5481	151.6
24	52	0.3912	132.8
48	30	0.2626	115.9
72	22	0.2051	107.4
168	12	0.1232	96.8
252	8.9	0.0923	95.9

RCS GAS SUMMARY			
0	430	1.4696	295.3
1	280	1.0949	256.2
4	140	0.7438	192.2
8	96	0.5799	166.0
12	74	0.4855	153.3
24	44	0.3329	132.3
48	24	0.2105	112.5
72	16	0.1577	102.0
168	7.8	0.0869	89.2
252	5.4	0.0611	88.4

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
CONTAINMENT ATMOSPHERE SUMMARY			
0	4.30	0.0170	249.770
1	1.20	0.0074	163.230
4	0.45	0.0050	89.670
8	0.25	0.0041	59.654
12	0.18	0.0037	47.760
24	0.11	0.0031	36.496
48	0.08	0.0025	31.960
72	0.07	0.0022	30.775
168	0.04	0.0012	30.240
252	0.02	0.0008	30.603
SI SUMMARY			
0	110	0.3657	290.970
1	69	0.2732	252.510
4	36	0.1874	190.200
8	24	0.1476	164.960
12	19	0.1247	152.720
24	12	0.0874	133.010
48	6.6	0.0571	114.920
72	4.6	0.0438	105.670
168	2.4	0.0254	94.245
252	1.7	0.0186	93.381

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

PASS LIQUID SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	70	0.1	14.29	4900	0.5	1.02	68600
0.1	900	70	0.1	12.66	4900	0.5	0.92	68600
0.1	800	70	0.1	11.43	4900	0.5	0.82	68600
0.1	700	70	0.1	10.00	4900	0.5	0.71	68600
0.1	600	70	0.1	8.57	4900	1.0	1.22	34300
0.1	500	70	0.1	7.14	4900	1.0	1.02	34300
0.1	400	70	0.1	5.51	4900	1.0	0.82	34300
0.1	300	70	0.1	4.29	4900	1.0	0.61	34300
0.1	200	70	0.1	2.86	4900	2.0	0.82	17150
0.1	100	70	0.1	1.43	4900	2.0	0.41	17150
0.1	90	70	0.1	1.29	4900			
0.1	80	70	0.1	1.14	4900			
0.1	70	70	0.1	1.00	4900			
0.1	60	70	0.1	0.86	4900			
0.1	50	70	0.1	0.71	4900			
0.1	40	70	0.2	1.14	2450			
0.1	30	70	0.2	0.86	2450			
0.1	20	70	0.3	0.86	1633			
0.1	10	70	0.5	0.71	980			
0.1	9	70	0.5	0.64	980			
0.1	8	70	0.5	0.57	980			
0.1	7	70	0.5	0.50	980			
0.1	6	70	0.5	0.43	980			
0.1	5	70	0.5	0.36	980			
0.1	4	70	0.5	0.28	980			
0.1	3	70	0.5	0.22	980			
0.1	2	70	0.5	0.14	980			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 7 ml and C2 = 1.4 mCi

PASS GAS SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	92	0.1	10.87	8464	0.5	0.59	155738
0.1	900	92	0.1	9.78	8464	0.5	0.53	155738
0.1	800	92	0.1	8.70	8464	0.5	0.47	155738
0.1	700	92	0.1	7.61	8464	0.5	0.41	155738
0.1	600	92	0.1	6.52	8464	1.0	0.71	77869
0.1	500	92	0.1	5.43	8464	1.0	0.59	77869
0.1	400	92	0.1	4.35	8464	1.0	0.47	77869
0.1	300	92	0.1	3.26	8464	1.0	0.35	77869
0.1	200	92	0.1	2.17	8464	2.0	0.47	38934
0.1	100	92	0.1	1.09	8464	2.0	0.24	38934
0.1	90	92	0.1	0.98	8464			
0.1	80	92	0.1	0.87	4232			
0.1	70	92	0.1	0.76	4232			
0.1	60	92	0.1	0.65	2821			
0.1	50	92	0.1	0.54	1693			
0.1	40	92	0.2	0.87	1693			
0.1	30	92	0.2	0.65	1693			
0.1	20	92	0.3	0.65	1693			
0.1	10	92	0.5	0.54	1693			
0.1	9	92	0.5	0.49	1693			
0.1	8	92	0.5	0.44	1693			
0.1	7	92	0.5	0.38	1693			
0.1	6	92	0.5	0.32	1693			
0.1	5	92	0.5	0.27	1693			
0.1	4	92	0.5	0.21	1691			
0.1	3	92	0.5	0.16	1693			
0.1	2	92	0.5	0.11	1693			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 9.2cc and C2 = 1.4 mCi

RMS P/I DOSE RATE - CURIE CONVERSION FACTORS					
Time After	I^{131}("G")	I^{132}("G")	I^{133}("G")	I^{134}("G")	I^{135}("G")
Accident *(hours)*	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr
0	1.20E-02	1.30E-02	2.60E-02	2.80E-02	2.40E-02
1	1.20E-02	9.30E-03	2.40E-02	1.30E-02	2.20E-02
2	9.40E-03	5.40E-03	1.80E-02	4.40E-03	1.50E-02
3	2.40E-02	1.00E-02	4.50E-02	5.10E-03	3.50E-02
4	2.90E-02	9.00E-03	5.30E-02	2.80E-03	3.80E-02
5	3.40E-02	7.80E-03	6.00E-02	1.50E-03	4.00E-02
6	3.80E-02	6.40E-03	6.50E-02	6.80E-04	4.10E-02
7	4.20E-02	5.30E-03	7.10E-02	3.80E-04	4.10E-02
8	4.60E-02	4.50E-03	7.50E-02	2.10E-05	4.00E-02
9	5.00E-02	3.60E-03	7.90E-02	9.00E-05	8.10E-03
10	5.40E-02	2.90E-03	8.30E-02	4.90E-05	3.90E-02
11	5.90E-02	2.10E-03	8.70E-02	2.10E-05	3.80E-02
12	6.20E-02	1.70E-03	8.90E-02	1.10E-06	3.60E-02
13	6.60E-02	1.20E-03	9.20E-02	5.40E-06	3.50E-02
14	7.00E-02	1.30E-03	9.50E-02	2.60E-06	3.30E-02
15	7.40E-02	6.80E-04	9.70E-02	1.40E-06	3.20E-02
16	7.90E-02	7.20E-04	1.00E-01	5.80E-07	3.00E-02
17	8.20E-02	5.30E-04	1.00E-01	3.00E-07	2.90E-02
18	8.60E-02	4.00E-04	1.00E-01	1.60E-07	2.70E-02
19	9.00E-02	3.40E-04	1.00E-01	6.70E-08	2.60E-02
20	9.40E-02	2.60E-04	1.10E-01	2.60E-08	2.50E-02
21	9.80E-02	1.80E-04	1.10E-01	1.80E-08	2.30E-02
22	1.00E-01	1.90E-04	1.10E-01	6.70E-09	2.10E-02
23	1.10E-01	1.00E-04	1.10E-01	3.00E-09	2.00E-02
24	1.10E-01	9.30E-05	1.10E-01	1.00E-09	1.90E-03
24 - 48	1.60E-01	3.10E-06	1.10E-01	1.60E-13	7.80E-03
48 - 72	2.40E-01	4.40E-09	8.20E-02	1.60E-21	1.10E-03
72 - 96	3.00E-01	4.30E-12	5.00E-02	1.30E-29	1.20E-04
96 - 120	3.40E-01	3.70E-15	2.60E-02	9.10E-38	1.20E-05

NOTE: P/I exposure rate is calculated assuming that the measurement is taken 1 foot from the P/I cartridge. These conversion factors are independent of the distance that the radiation measurement is taken.

Appendix M - Ultimate Heat Sink considerations

1.0 Ultimate Heat Sink considerations

For an alternate source of Spray Pond inventory, direct Maintenance and Engineering to implement actions necessary to restore Spray Pond inventory, with particular respect to the following items:

1.1 Ensure that these actions are initiated within 6 days following a seismic event/SSE that results in irreparable damage to the 3 onsite wells which supply makeup water to the spray pond.

1.2 Secure a dependable water supply capable of delivering 1200 gpm within 21 days of an SSE or other accident which eliminates or restricts normal water supply to an inadequate level.

1.3 Ensure that the Environmental Department files a Notice of Intent to Drill with the Arizona Department of Water Resources before new well drilling commences.

1.4 Ensure that, as soon as practical, the Environmental Department applies for a temporary permit to withdraw groundwater in excess of our grandfathered right by submitting evidence that an emergency exists to the Director of the Arizona Department of Water Resources.

1.5 Ensure that Spare Well Water Pump (MLIS ID #45750074) and 200 HP, 3-phase, 1800 rpm Electric Motor (MLIS ID #44670001) have been adequately maintained under PM Task 054390.

1.6 Ensure an accurate assessment of current water inventory, normal water supply system status, time estimates for restoration of normal systems, identification of alternate supplies, and technically sound solutions to any outstanding water supply problems.

1.7 Ensure that a well drilling company capable of constructing a well within 15 days is mobilized.

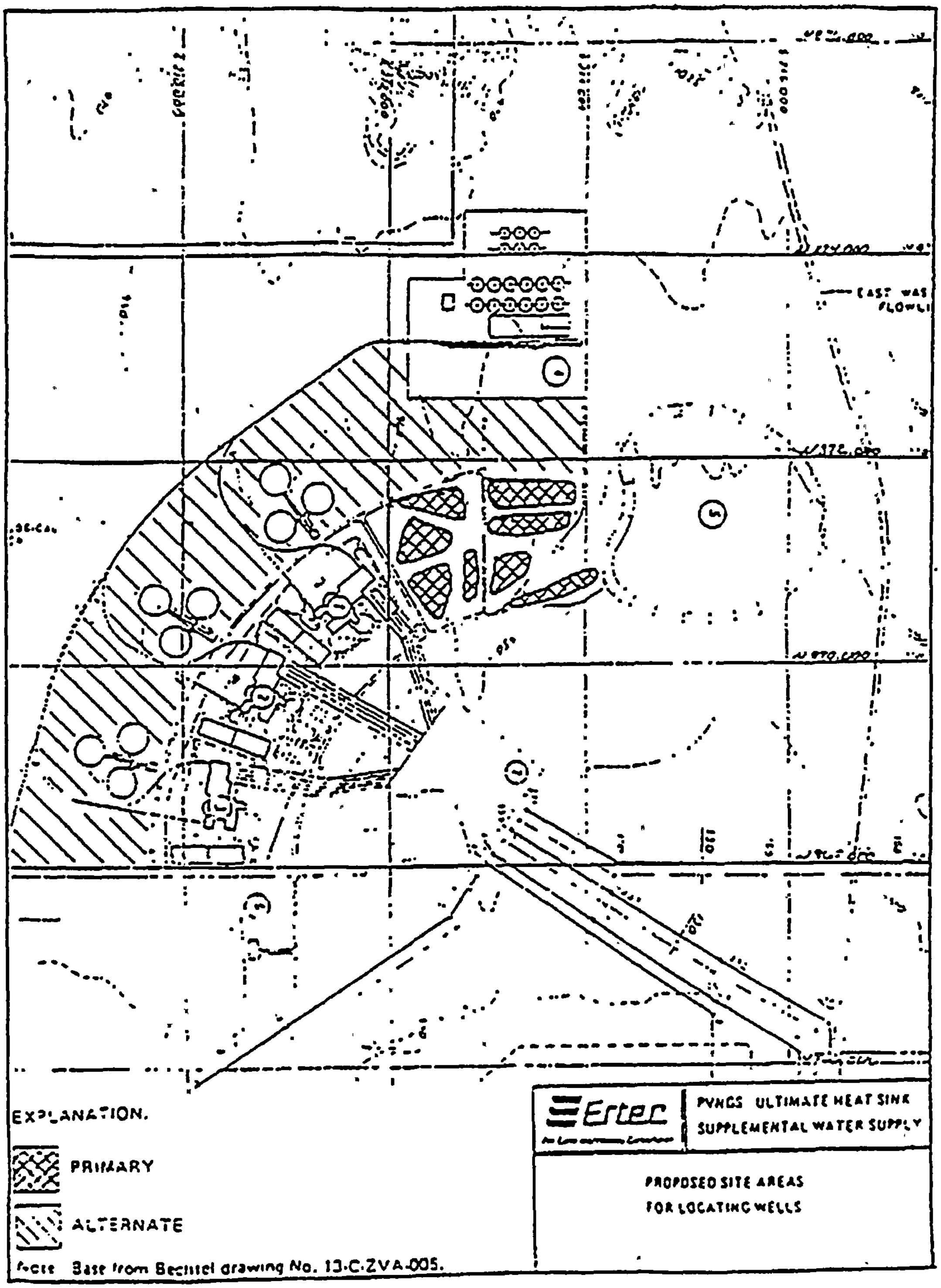
1.8 Ensure that a supply company capable of delivering temporary piping is mobilized.

1.9 Identify alternate routes to the site from Phoenix or possible equipment air lifts.

1.10 Determine the extent of damage to the 2 normal production wells 34abb and 27ddc and the standby well 27cbc with work initiated to restore the normal production wells and the standby well to service.

1.11 Reference the ERTEC drawing on the next page for well site selections.

2.0 Ertec Drawing



Appendix N - EOF Diesel Generator Operations

1.0 EOF diesel generator startup

1.1 On loss of power to the EOF, verify that both normal (1E-NAN-S06 source) and emergency (1E-NAN-S05) AC power is not available, by communicating with the Control Room of an unaffected Unit (there should be an LOP or Trouble on both the 1E-NAN-S05 and S06 buses). If power is verified to be out and it has been decided not to evacuate to the Backup EOF, then continue with this procedure. EOF maps included after the procedure steps may be of assistance.

NOTE

Immediately notify the Administrative & Logistics Coordinator if any problems are encountered in the conduct of this procedure. It may become necessary to evacuate the EOF.

1.2 Verify installation of the 4/0 (minimum) ground conductor between the generator breaker box and the ground lug provided beneath receptacle AE-NZN-I01.

1.3 Verify installation of the secondary trailer ground conductor between the trailer frame (tongue end) and the grounding conductor of transformer A-E-NGN-L51X.

1.4 Verify installation of the generator power cable plug to receptacle AE-NZN-I01. The keyway in the plug receptacle assembly ensures proper circuit phasing is maintained. Secure the plug to the receptacle using the integral receptacle fasteners.

CAUTION

The following step is critical to personnel safety and equipment protection. THIS STEP SHALL BE COMPLETED PRIOR TO THE APPLICATION OF GENERATOR POWER. This action isolates AEZYNDOX20 (PDP-E) panel loads from the building electrical distribution system, allowing alignment to the diesel generator.

1.5 With concurrent verification, at panel A-E-NZN-D0X-08 (EDP), open the circuit breaker marked "PDP-E MAIN BKR AEZYNDOX20" - "Main Panel PDPE" (this is the bottom breaker in this panel). All other breakers in this panel are to remain closed.

1.6 With concurrent verification, open all circuit breakers at distribution panel AEZYND0X20 (PDP-E).

1.7 With concurrent verification, unlock and close Safety Switch AE-NZN-U0X-02. [lock combination is 1796].

1.8 With concurrent verification, place the Safety Switch padlock upon door handle pin of panel A-E-NZN-D0X-08 (EDP) to secure and lock the door in the closed position.

1.9 Start the diesel generator as described below. The mechanical controls are located on the left side of the engine-generator trailer, on the engine itself.

NOTE

If the diesel will not start or run acceptably, notify the Administrative & Logistics Coordinator. It may be necessary to prepare to evacuate the EOF.

1.10 Locate the Engine Start switch. This switch is a push-to-turn, spring return to normal type, marked HEAT-OFF-START, that controls both the diesel glow plug pre-heating and the engine starter.

1.11 Push in, turn the switch to the left (CCW, to the HEAT position), and hold the switch in this position to preheat the diesel cylinders. Approximate preheat time requirements are described below:

Outside temperature	Pre-Heat Time
Above 60 degrees F	None
Below 60 degrees F to 32 degrees F	1 minute
Below 32 degrees F	2 minutes

1.12 Release the switch, then push-turn to the right (CW, to the START position) to start the engine. Release the switch when the engine commences to run.

1.13 Adjust the throttle (CW) adjacent to the starting switch as required to bring the engine to running speed, as indicated by the Voltage (490-500 VAC) and Frequency (61-63 Hz) Meters on the Generator Output Breaker Control Panel. This panel is located on the rear right side of the engine-generator trailer.

1.14 If radiological conditions permit, allow two minutes of unloaded run time before closing the generator output breaker and loading the generator.

1.15 With concurrent verification, close the generator AC output breaker (open the electrical box and push the breaker handle upward).

1.16 With concurrent verification, at Distribution Panel AEZYND0X20 (PDP-E), close the following breakers: Air Compressor CHC-1, Air Handler AO-1, Filter RFU-1, LPB Panel EOF, Mech. Equip. Rm Exhaust Fan EF-11, Pump No. 5 P-5, Chiller No. 2 C-2.

2.0 EOF HVAC system restart

NOTE

These steps assume that the EOF ventilation system is operating in the filtration mode and the cooling tower CT-1 is operating or available.

2.1 With concurrent verification, locate the Cooling Tower CT-1 Filter Isolation Valves V103 and V104. Verify they are in the open position (with handles parallel to the piping).

2.2 With concurrent verification, at Cooling Tower Control Panel AJZYNE05, verify the selector switch to (or set it to) position CT-1.

2.3 With concurrent verification, at Panel AEZYND0X20 (PDP-E) close the circuit breakers for pump P-2 and cooling tower CT-1.

2.4 With concurrent verification, at the control panel on Main Chiller #1, AMZYNE0X1, press the selector (rocker type) switch to STOP/RESET.

2.5 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

2.6 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

2.7 Check generator voltage and frequency at Control Panel; adjust throttle as required to maintain frequency above 60 Hz.

2.8 Return to EOF and report to Administrative and Logistics Coordinator that power has been restored.

2.9 OPTIONAL - Operational performance of the Air Handling Unit AEZYNA0X01 can be determined by observing the temperature differential between temperature indicators TI-0024 (chilled water return) and TI0025 (chilled water supply). After 5 minutes of chiller operation, the temperature of TI-0024 should be greater than TI-0025. The thermometer-type temperature indicators are mounted at eye level on the respective chilled water lines indicated above. See the "Building Arrangement" sketch 2 of 2 in this procedure for their approximate physical location in the room.

3.0 Brown-out

In the event that a diesel generator overload condition is detected (generator output current approaching 300 Amperes, or if "brown-out" conditions are detected in the EOF, perform the following steps:

3.1 Obtain the master key from the key box in EOF room #7.

3.2 Inside the EOF pump room (Room #14 - left wall) locate distribution panel LPB (AEZYNDOX14), and open the panel. Open breakers #31 through 42. This sheds the EOF duct heaters from the generator load.

3.3 If necessary, locate panel RBA (AEZYNDOX12) inside the telephone equipment room on the left side of the EOF Command Center (left wall). Open breakers #24, 26, 28, and 30. The master key will also open the room door if locked.

3.4 Re-check the generator load current at the engine panel to confirm the load demand is within acceptable limits.

3.5 Return the master key to the key box in Room #7.

4.0 Brown-out restoration

To restore the original conditions before the load-shed was accomplished:

4.1 Obtain the master key from key box in EOF Room #7.

4.2 Locate distribution panel LPB; re-close breakers #31 through 42.

4.3 Locate distribution panel RBA; re-close breakers #24, 26, 28, and 30.

4.4 Return the master key to the key box in room #7.

5.0 **Restoring normal power.**

NOTE

If available, Electrical Maintenance may be requested to perform the power restoration described below.

5.1 Notify the Administrative & Logistics Coordinator before diesel shutdown and power restoration. A short duration power outage of the EOF is required to perform realignment of the feeder circuit.

5.2 Verify that offsite power is available and has remained stable for 15 minutes minimum, and that normal and/or emergency AC power is available at the transfer switch A-E-NZN-U0X-01.

5.3 With concurrent verification, open all circuit breakers on the distribution panel AEZYND0X20 (PDP-E).

CAUTION

The following step is critical to personnel safety and equipment protection. This step shall be completed prior to the restoration of normal power.

5.4 With concurrent verification, remove the lock from the door handle of panel A-E-NZN-D0X-08;

5.5 With concurrent verification, open and LOCK safety switch AE-NZN-U0X-02. This isolates the diesel generator from the building power distribution system.

5.6 With concurrent verification, in the EDP panel [A-E-NZN-D0X-08], close the breaker feeding the PDP-E panel. This breaker is located at the bottom of the EDP panel

5.7 With concurrent verification, close all the breakers in distribution panel AEZYND0X20 (PDP-E), including those of the elevator and the water heater.

5.8 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

5.9 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

6.0 Shutting down the diesel engine:

6.1 Confirm that the EOF has been reconnected to the normal/emergency source(s) of off-site power.

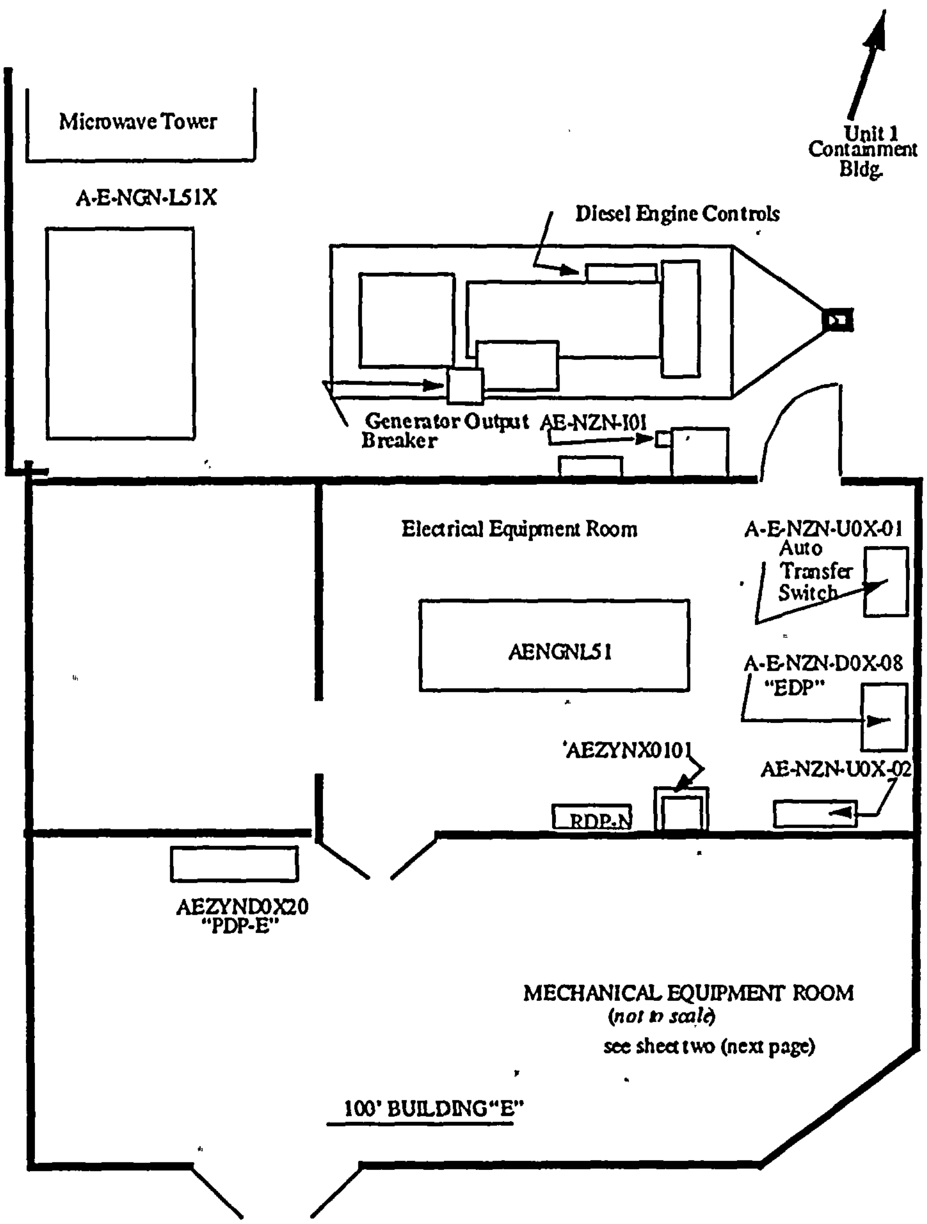
6.2 Return the throttle to the idle (approximately vertical) position.

6.3 Locate the STOP lever on the left side of the engine generator trailer (physical location is to the left of the starting switch). Rotate the lever approximately 30 degrees CW; this shuts off the fuel supply to the engine. Hold the lever in place until the engine is fully stopped, then release the stop lever.

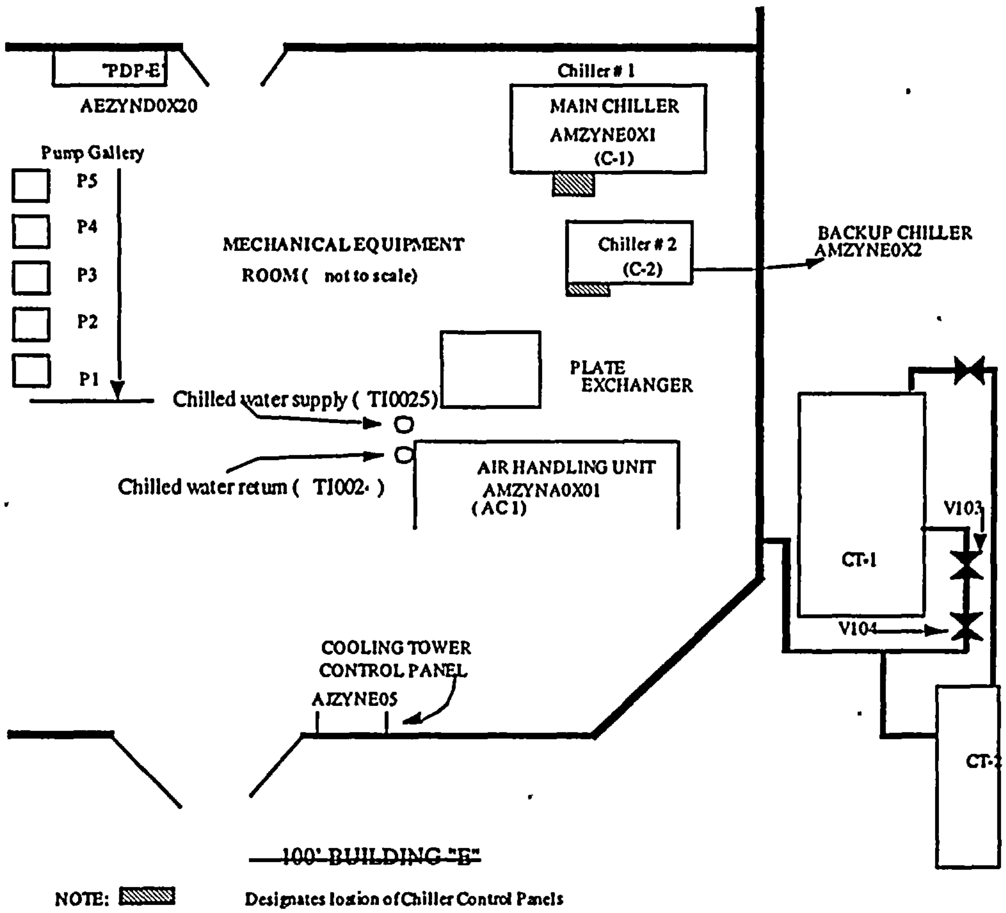
6.4 With concurrent verification, open the diesel generator AC output circuit breaker.

6.5 Notify the Administrative & Logistics Coordinator that power transfer has been completed.

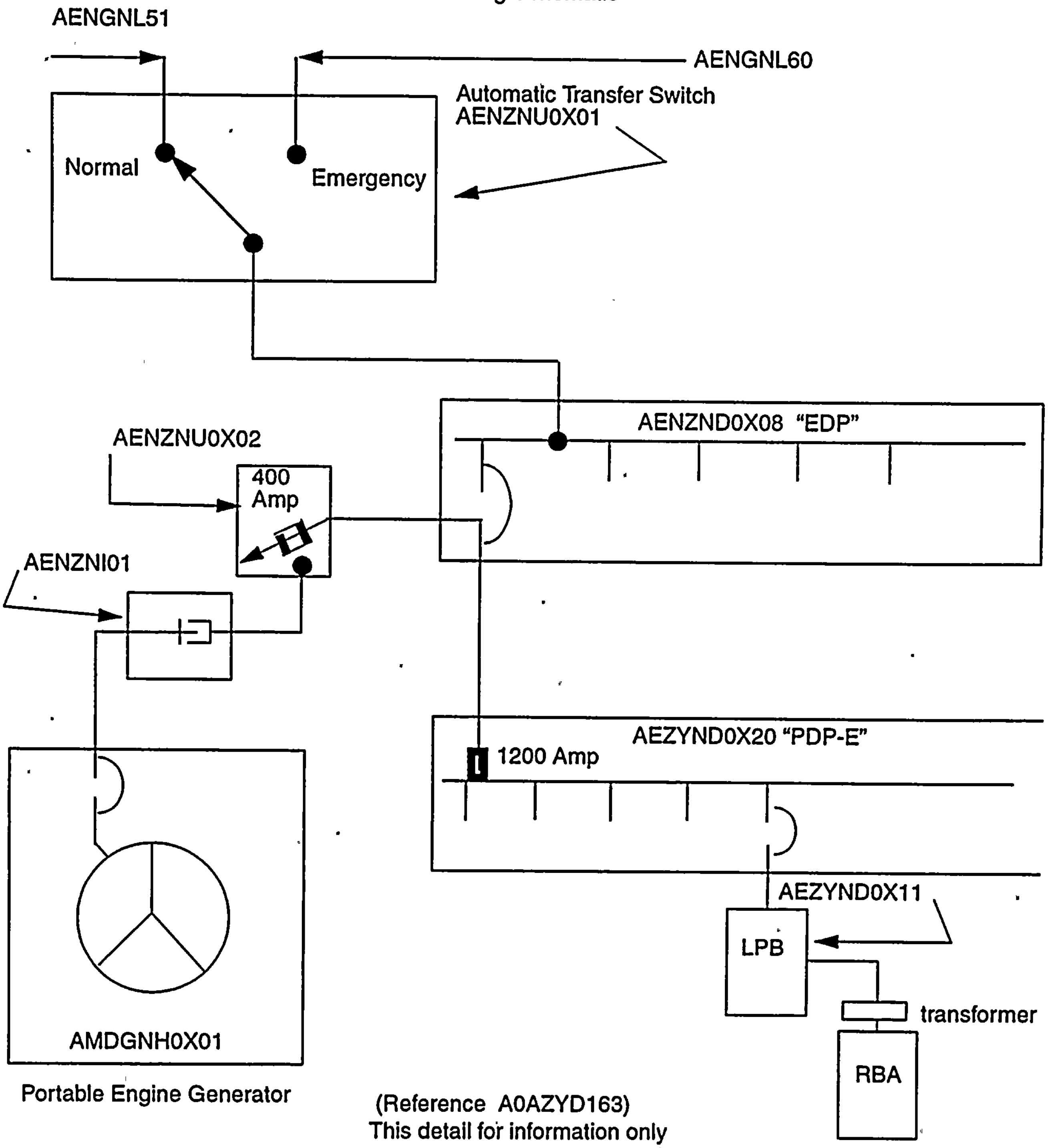
Building Arrangement & Equipment Location (1 of 2)



Building Arrangement & Equipment Location (2 of 2)



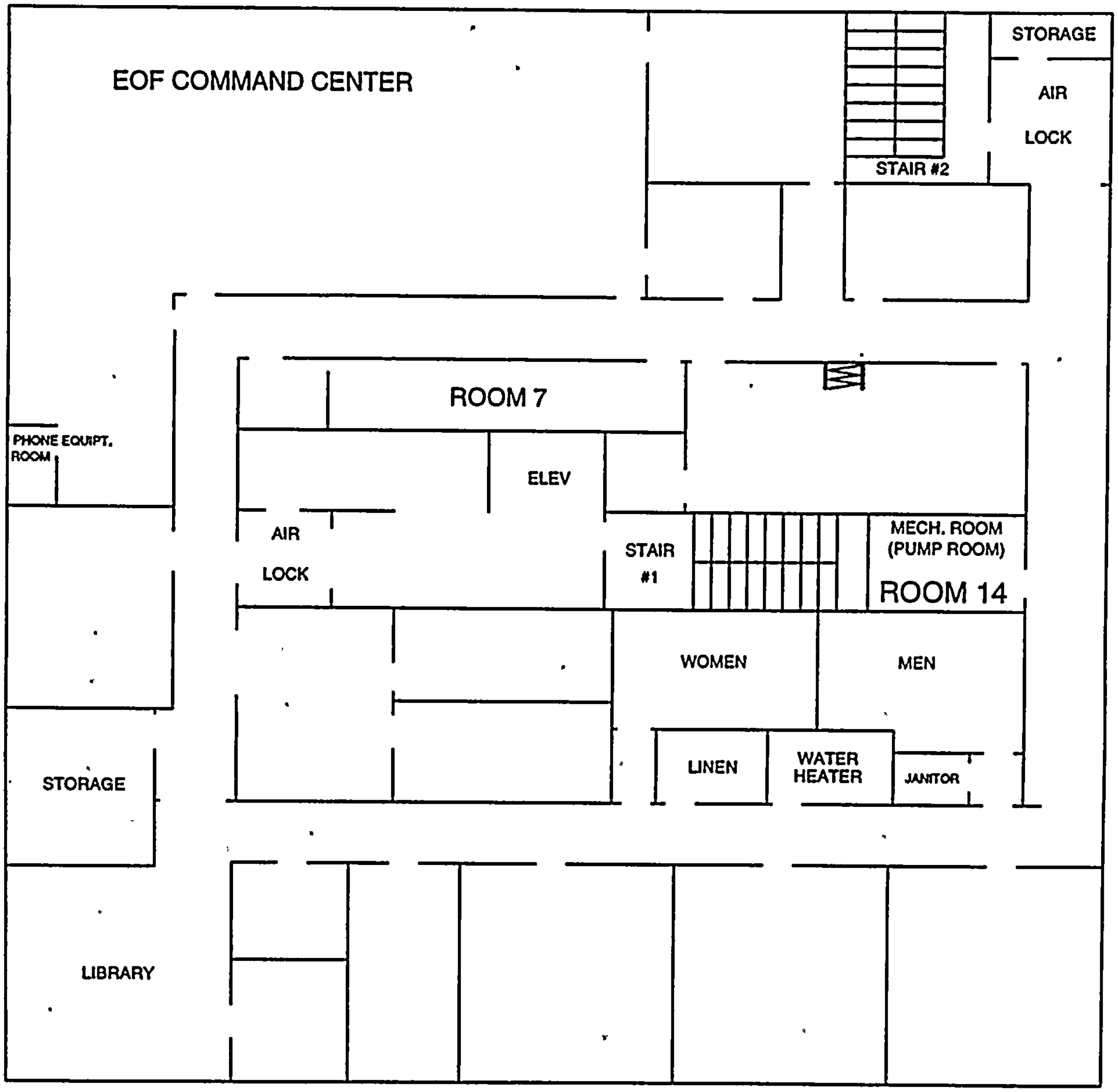
Wiring Schematic



Portable Engine Generator

(Reference A0AZYD163)
This detail for information only

EOF Floor Plan



Appendix O - ERFDADS operation

1.0 Noteworthy items:

1.1 ERFDADS is comprised of the following 4 sections:

1.1.1 SPDS Displays Menu

1.1.2 P&ID Menu

1.1.3 Thermal Performance (not addressed in this Appendix)

1.1.4 System Function Displays Menu

1.1.5 User Displays Menu (not addressed in this Appendix)

1.2 The mouse used for cursor positioning is optical in nature, making it sensitive to mouse pad orientation and mouse pad cleanliness. Food or drink should not be consumed near ERFDADS workstation areas.

1.3 If all data values on any display turn magenta, Operations Computer Systems (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

1.4 If the system appears to be functioning incorrectly or becomes locked up, the system should be rebooted.

1.5 Help is available from almost anywhere within the ERFDADS display regions. It can generally be accessed from the top menu bar by selecting the option with the left mouse button. A "Help" window will appear containing help for those items accessible within the main window in focus.

1.6 Top Menu Bar Functions

1.6.1 FILE

1.6.1.1 Reset Display: Redraws the current display back to defaults

1.6.1.2 Clear: Erases the current display except for the menu bars

1.6.1.3 Print Window Laser: Prints in black and white (this is the fastest printing option)

1.6.1.4 Enh Prnt Wndw Lsr: Prints an enhanced printout

1.6.1.5 Print Window Color: Prints a color printout

1.6.1.6 Quit: Ends the current mmi session and returns to the desktop

1.6.2 Edit: Allows use of cut and paste functions

1.6.3 OPTIONS

1.6.3.1 Point List: Lists all available ERFDADS points (~3000)

1.6.3.2 Trend List: lists all user-defined trends / groups

1.6.3.3 Logon: Allows access to controlled-access functions

1.6.3.4 Logoff: Allows logoff to prevent unauthorized access

1.7 Bottom Menu Bar Functions

1.7.1 Top Menu: Returns to the top main mmi display

1.7.2 Screen Up: Decrements 1 screen display

1.7.3 Screen Down: Increments 1 screen display

1.7.4 Previous Screen: Returns to the last displayed screen

1.7.5 Silence: Silences any Level 1 or Level 2 audible alarm

1.7.6 Audible List: Displays all points currently in alarm status

1.7.7 Text Input Box: Allows entry for a trend display name

1.8 MMI Menu Bar Functions: The mmi Menu Bar Functions are accessed by selecting the gray bar at the top of the current window with the right mouse button. The following options can be selected with the right mouse button from the drop-down menu:

1.8.1 Close: Reduces the mmi window to an icon

1.8.2 Full Size: Maximizes the current window to full-screen

1.8.3 Move: Allows for dynamic window positioning

1.8.4 Resize: Allows for dynamic window sizing

1.8.5 Back: Changes focus to other windows currently open

1.8.6 Refresh: Redraws the last display with the current time

1.8.7 Quit: Ends the current mmi session and returns to the desktop

1.9 Workspace Menu Functions: Workspace functions are accessible by closing the mmi window to an icon and selecting a point anywhere within the light blue background area with the right mouse button. The following options can be selected with the right mouse button from the pop-up menu:

1.9.1 Restart ERFDADS: Automatically shuts down and restarts the system

1.9.2 ERFDADS MMI: Allows opening of up to 4 mmi windows concurrently

1.9.3 ERFDADS CSF: Allows opening of a new SPDS window

1.9.4 Remote RMS: Opens RMS display for "Unit 1 (RED)", "Unit 2 (YELLOW)", or "Unit 3 GREEN)"

1.9.5 Print Tool: Allows spooling a SUN file to any of several printers

1.9.6 Print Window Laser: Allows black & white printout from a colored window

1.9.7 PTARS: Allows view / edit of post-trip trend data

1.9.8 Kill PTARS: Stops PTARS and returns to blank workspace display

1.9.9 Exit: Shuts down the system and returns to "Logon" display

1.10 SPDS Menu Functions: SPDS displays are configured to allow for monitoring of critical safety functions, to allow for event diagnosis and classification, and to notify Control Room personnel with messages similar to control board annunciators. 101 displays are available. Movement between multiple page displays can be performed by using the "Up / Down" buttons located toward the bottom of the display. The SPDS Display Menu consists of 2 pages listing the following options:

1.10.1 Critical Safety Functions: Contains 10 selections to allow operators to evaluate CSF criteria

1.10.1.1 Critical Safety Functions: Overall list of the individual critical safety functions

1.10.1.2 FR Safety Func Tracking: Allows tracking of the above functions

1.10.1.3 Safety Func Status Check: Shows status of the above functions

1.10.1.4 Reactivity Control: One of the critical safety functions

1.10.1.5 Vital Auxiliaries: One of the critical safety functions

1.10.1.6 Press Control: One of the critical safety functions

1.10.1.7 Heat Removal: One of the critical safety functions

1.10.1.8 CTMT Integrity: One of the critical safety functions

1.10.1.9 CTMT Atmos: One of the critical safety functions

1.10.1.10 Inventory Control: One of the critical safety functions

1.10.2 Safety Injection Delivery: Contains 4 selections to provide equipment status:

1.10.2.1 HPSI Curve: Displays HPSI pump curve based on current parameters

1.10.2.2 LPSI Curve: Displays LPSI pump curve based on current parameters

1.10.2.3 Train A/B SI: Displays current status of pumps / valves and parameters

1.10.3 Operator Information: contains 5 selections to aid operators:

1.10.3.1 Event Classification: Suggests event classifications based on parameters

1.10.3.2 Personalities: Allows selecting Control Room Supervisor, Primary Operator, or Secondary Operator

1.10.3.3 SPDS Overview: Provides an overview of SPDS

1.10.3.4 PZR Cooldown: Shows pressurizer cooldown rate in deg F/hr and 15 minute averages

1.10.3.5 RCS Cooldown: Plots 15-minute average primary cooldown rates

1.10.3.6 Multi-Input: Displays pages of multi-input parameters for SPDS

1.10.3.7 Rad Monitors: Summary of current radiation levels

1.10.3.8 RCS P/T - NPSH Curve: Displays RCP parameters with typical NPSH curves

1.10.3.9 ERDS Link: Allows activation of the ERDS link to the USNRC

1.11 Advisory Messages: At the bottom of each SPDS display are 5 buttons corresponding to 5 message sets the operator can use for immediate notification of system, component, or parameter status. Each can be displayed in 1 of 5 colors representing a hierarchy of importance. When a monitored parameter reaches a given message setpoint, the button holding the message set for that parameter will change to 1 of 5 colors and the message will be displayed within the bounds of the specified button. The 5 colors and their importance are represented as follows:

1.11.1 Red: Urgent informational messages

1.11.2 Yellow: Caution informational messages

1.11.3 Green: Important informational messages

1.11.4 Blue: Time-dependent informational messages

1.11.5 White: Helpful informational messages

1.12 Operator EOP Support: This area of the Safety Parameter Display System consists of a series of pages used to assist Control Room Operators in monitoring the status of the plant for each Emergency Operating Procedure. Following a reactor trip, ERFDADS will evaluate which event is occurring. When the "Overview" button is selected with the diagnosed EOP message, the system will display the diagnosed EOP display for that section. The diagnosis cannot be overridden. The diagnosed EOP support display must be escaped and the EOP support display for the desired EOP must be accessed. Each operator has access to selected pages in the EOP support area pertaining to the specific operator function relative to his/her Control Room position. These pages are consistent with plant equipment and parameters intended for that portion of the EOP a specific operator is currently performing. When a safety function is not satisfied, the Functional Recovery Procedure will be diagnosed by ERFDADS and the operators would begin monitoring the screens specific to that EOP.

1.13 P&ID Functions: P&ID displays organize system parameter data into a graphical layout of the system and provide the current data for each parameter associated with each layout. The 43 displays currently available are separated into similar categories - primary systems, secondary systems, electrical systems, etc. To access a system, select the P&ID box from the top menu. A display will appear with all the major systems categorically organized. Selecting a display will present that system along with most of the available ERFDADS points associated with that given system and the current status of each point. To view a trend of a specific parameter, select the given parameter's value. Either the attributes (analog or digital) display will appear or a multi-input display for a calculated point (SPDS point) will appear. If the multi-input display appears, select the point again for the attributes display. Selecting the "Trend-1" button located at the lower left portion of the attributes screen will display a trend for that specified point. To return to the system display, select "Previous Screen" twice (selecting the gray screen title button returns to the main P&ID display). Data is displayed in the P&ID screens using the following format:

1.13.1 Green: Reliable value

1.13.2 Magenta: Failed validity check

1.13.3 White: Suspect data

1.13.4 Orange: Exceeded a rate-of-change setpoint

1.13.5 Yellow: Exceeded a HI or LO setpoint (Level 2)

1.13.6 Red: Exceeded a HI-HI or LO-LO setpoint (Level 1)

1.13.7 Cyan: Manually input data

1.14 The following selections, attributes, displays, and options are available from the System Function Displays Menu:

1.14.1 Alarm Mode Selection - This option changes the mode for which alarms are determined. Modes available are Modes 1-6 and Harsh Containment. The calculation is normally performed automatically, but can be overridden by Control Room Supervision via a logon password.

1.14.2 Analog Point Attributes - This option displays the current value for any analog ERFDADS point. Also provided is information on associated instrumentation and alarm values, if appropriate. Calculated points will list, in addition, the calculations and point values which are used to determine the SPDS point.

1.14.3 Archive Copy - For normal post-trip actions, the active PTARS file can be copied to the secondary PTARS file and the active 14-hour file, to the secon-dary 14-hour file. 15 minutes should be allowed for the copy procedure to complete. Data archived in this manner can only be accessed from the server it was saved to. Copying of files with this option is also allowed for DAT tape backup purposes. All archive operations from this option can be performed at any time, regardless of reactor status.

1.14.4 Archive Retrieval - This function is used to retrieve data for ERFDADS graphs and is different than PTARS retrieval. Output from 7 available files can be viewed as trend graphs, X-Y plots, tabular lists of values, or ASCII files.

1.14.5 Audible Alarm Configuration - (function available only to OCS personnel)

1.14.6 Demand Scan - Use this selection when data for a single point (analog or digital) is needed for any single point in time. Since the result is a "snapshot" of current conditions at the time it was invoked, the value will not change. This is in contrast to the analog / digital point attributes function, which maintains a continuing update of a specified value as it changes over time.

1.14.7 Digital Point Attributes - Functions identical to the Analog Point Attributes Function, except for digital points (i.e., valve / breaker / pump states) only. Alarms can also be assigned for this option following the same procedure as discussed previous. However, since digital points monitor 2 states (0 or 1), the only value gained would be alarming pump start / stop, valve open / close, or breaker open / close.

1.14.8 ERDS Communication Link - This option is used to activate the Emergency Response Data System link to USNRC Operations Center. Instruction for use is discussed in the Emergency Response Data System Instructional Guide.

1.14.9 External Health Interface - This option is used to monitor the status of communications links from ERFDADS to QSPDS, RMS, and ERDS for errors.

1.14.10 Group Update - This function allows the user to group sets of points for display as a group trend (up to 4 points per group), group bar chart (up to 6 points per group), or a tabular display (up to 24 points per page). Group trends default to the preset range and must be changed every time they are invoked if the range was not valid. This is in contrast to user trends, which are saved with the range selected by the user and will always be loaded into memory with that range.

1.14.11 Log Information Update - This option allows the user to retrieve a saved set of data that will display the current status and current parameter value when invoked. The data can also be spooled to a printer.

1.14.12 Log Summary - The summary contains a listing of user configured files which can be used for log information update. Selecting a file name from the menu will display the particular data input for that file.

1.14.13 Message Retrieval - Use this function to monitor error and system messages. Of the 6 messages, the Primary Alarm is the most useful choice, which will invoke a listing of all alarms that have occurred. Also displayed will be the time each has occurred and the time each has cleared (if relevant), the value that caused (and cleared) the alarm, and the type of alarm (Level 1 / Level 2). By specifying a filter, the user can select which alarms to display based on the plant system designator. The time frame available, however, is limited to the current active 14-hour file.

1.14.14 Password Update - Passwords can be changed from this option. Access is limited to Operations Computer Support personnel only.

1.14.15 Point Summaries - This summary provides a list used to check the status of various points, such as those alarming, those which have their alarm function bypassed, those which have an audible alarm assigned, those removed from scan, those assigned manually substituted values, or those currently without valid values. Separate listings exist for analog and digital points.

1.14.16 System Health - This function is used to monitor the status of all ERFDADS terminals having the ability to access the specific Unit's data (18 terminals).

1.14.17 Tabular Display - Selecting this option invokes a tabular listing of up to 24 points per page, each of which will list the point name, description, and the current value with units of measurement.

1.14.18 Unit / Server Switch - This option is used to change the Unit or server from which to receive data. 2 redundant servers exist, of which each is capable of performing all functions in the event that the other server is no longer capable of performing its function. Each STSC terminal in a specified Unit should be linked to a different server. When server changes are made and the "Apply" option is selected from the pop-up window, the white highlighted text will shift to the new server selected and the switching is completed. When switching Units, compliance with the pop-up message box is required. The user must wait approximately 1 minute for confirmation that the change has occurred prior to continuing.

2.0 Troubleshooting the System

2.1 Mouse Will Not Move or Moves Slowly - The mouse used for cursor positioning is optical in nature, making it sensitive to mousepad orientation and mousepad cleanliness. Rotate the mousepad 90º and clean the pad. Ensure that the mouse connector to the keyboard is fully inserted. Ensure that the keyboard connector to the computer is fully inserted.

2.2 System is Responding Extremely Slowly - The most likely cause is that both terminals are linked to the same server. Ensure that each terminal is linked to a different server. If the problem persists, exit the system on 1 terminal and log back on. Repeat this procedure for the other terminal.

2.3 Fatal Error Message Received When Trying to Retrieve Data - Verify that the correct date and time were entered and that the correct data file is being used for the date and time desired. For example, this error may occur if the user is attempting to retrieve data 18 hours old from the 14-hour file. This error can also occur when a user selects a PTARS data file and 1 of the points displayed is not a PTARS point. In this case, the invalid point should be deleted or a different data file type should be selected. Server shifts can also occur after performing an archive copy. The cause for this is unknown, but the user should ensure that the server the terminal is linked to remains the same after the copy is performed. If it is not, the terminal should be switched back to its original server.

2.4 MMI Display has Disappeared - Search for an mmi icon at the bottom of the current display. If found, reopen the window with a double-click on the icon with the left mouse button. If no icon is found, select a point anywhere within the light blue background area with the right mouse button. This action will invoke the Workspace Menu. Select "ERFDADS MMI" if listed or "Restart ERFDADS" if it is not.

2.5 Data is Missing From the Point List / Trend List - This error message can occur when trying to invoke a trend list or when trying to transmit a trend to 1 of the terminals in the Control Room. If an error message stating that no files can be found or that the file cannot be sent, the link to that module has most likely been lost. The system must be rebooted to reconnect all file links.

2.6 All Data Values on a Display Turn Magenta - 1 or both DAS Units have crashed. Invoke the "System Health" display from the "System Functions" Menu and view the status of the DAS Units. If only 1 unit is unavailable, switch to the available server. If both DAS Units are unavailable, the system is unavailable and is not accessible from any of the units. Contact 1 of the other Units to ensure availability of meteorological data. Operations Computer Support (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

2.7 Auto-Logout Message Received - This is a normal message that is received when 5 minutes have elapsed after performing a logon to activate ERDS or to perform an Archive Copy. The automatic logoff occurs to prevent unauthorized access should the user leave the area. Auto-Logout has no effect on system capabilities.

2.8 Color to Black & White Prints Not Working - If the correct screen print is not occurring (i.e., a zoomed icon picture prints), ensure that the mmi icon is reopened within 8 seconds. The "Snapshot" program incorporates an 8-second delay to allow the user to select the desired window. When the 8 seconds have timed out, the next item which is selected will print.

2.9 System Appears to Function Incorrectly or is Locked Up - Perform a system reboot.

3.0 System shutdown

If it becomes necessary to shut down the system for the purpose of rebooting, perform the following actions:

3.1 Close the "mmi" window by selecting the "down arrow" button toward the upper left portion of the display with the left mouse button.

3.2 Invoke the "Workspace Menu" by selecting a point anywhere within the light blue background area with the right mouse button.

3.3 Select "EXIT" from the "Workspace Menu" with the right mouse button.

4.0 System startup

If the system accepts no mouse commands, perform the following actions to start up the system:

4.1 Press the <STOP> and <A> keys simultaneously.

4.2 From the "Options" List, type N (new) at the ">" Prompt. (This display may not appear.)

4.3 Press <Return>.

4.4 When the "Type Help for more information" message appears, type sync on the "OK" Line.

4.5 Press <Return>.

4.6 At the Login Display, type ERFDADS (or the STA Login ID) and press <Return>.

4.7 At the "Password" display, press <Return>.

5.0 ERDS Transmission Data Set

POINT ID	DESCRIPTION	POINT ID	DESCRIPTION
ARF38	Condenser Air Removal Flow	SPDS 0093	RCS T-Cold Loop 1A
CPF42	Plant Vent Exhaust Flow	SPDS 0094	RCS T-Cold Loop 1B
HFF93	Fuel Building Exhaust Flow	SPDS 0095	RCS T-Cold Loop 2A
RDL10	Reactor Cavity Sump Level	SPDS 0096	RCS T-Cold Loop 2B
RDL410	CTMT Sump Level East	SPDS 0109	Time Since Reactor Trip
RDL411	CTMT Sump Level West	SPDS 0143	Wind Speed - 35' 15-Minute Avg
SEJ1AA	Excore Log Power Channel A	SPDS 0144	Wind Direction - 35'
SEJ1BB	Excore Log Power Channel B	SPDS 0146	Atmospheric Stability Class
SENIS1	Excore StartUp Power Channel 1	SPDS 0194	Estimated Core Flow - lb/m Avg
SENIS2	Excore StartUp Power Channel 2	SPDS 0203	Charging Flow
SIL706	CTMT Recirculation Sump A Level	SPDS 0215	LPSI A Flow
SIL707	CTMT Recirculation Sump B Level	SPDS 0216	LPSI B Flow
SPDS 0001	Pressurizer Pressure	SPDS 0217	HPSI Flow to Loop 1A
SPDS 0002	CTMT Pressure	SPDS 0218	HPSI Flow to Loop 1B
SPDS 0003	S/G #1 Pressure	SPDS 0219	HPSI Flow to Loop 2A
SPDS 0004	S/G #2 Pressure	SPDS 0220	HPSI Flow to Loop 2B
SPDS 0005	S/G #1 Actual Wide Range Level	SPDS 0606	RU-004 10-Minute Avg
SPDS 0006	S/G #2 Actual Wide Range Level	SPDS 0607	RU-005 10-Minute Avg
SPDS 0007	Auxiliary Feedwater Flow to S/G #1	SPDS 0635	RU-139A 10-Minute Avg
SPDS 0008	Auxiliary Feedwater Flow to S/G #2	SPDS 0636	RU-139B 10-Minute Avg
SPDS 0009	CTMT Temperature	SPDS 0637	RU-140A 10-Minute Avg
SPDS 0013	Log / Linear Reactor Power	SPDS 0638	RU-140B 10-Minute Avg
SPDS 0015	Reactor Vessel Level - Head	SPDS 0639	RU-141 10-Minute Avg
SPDS 0016	Reactor Vessel Level - Plenum	SPDS 0640	RU-143 10-Minute Avg
SPDS 0017	RCS T-Hot Loop 1	SPDS 0643	RU-145 / 146 10-Minute Avg
SPDS 0018	RCS T-Hot Loop 2	SPDS 0644	RU-148 10-Minute Avg
SPDS 0021	Subcooling Margin	SPDS 0645	RU-149 10-Minute Avg
SPDS 0052	RWT Level	SPDS 0671	RU-155D 10-Minute Avg
SPDS 0054	Actual Pressurizer Level	SPDS 5035	S/G #1 Feed Flow Rate
SPDS 0079	Representative CET	SPDS 5036	S/G #2 Feed Flow Rate
SPDS 0082	CTMT Hydrogen Concentration		

Appendix P - Recovery Organization

1.0 Noteworthy items

1.1 Recovery operations may initiate when the plant is in a controlled and stable condition. No action should be taken to disturb this condition without express approval of the Recovery Manager.

1.2 Long term post-emergency efforts that follow a major incident are a functional responsibility of the Recovery Organization and can be performed by PVNGS and other Arizona Public Service Company personnel, contract experts and specialists, and qualified engineers under the direction of the Recovery Organization.

1.3 The Emergency Operations Director, filled by the Vice President - Nuclear Production, or designated alternate, will assume the duties and responsibilities of the Recovery Manager and, with the advice of the Emergency Coordinator, will be responsible for implementing the direction in this document. S/he will have overall corporate responsibility for restoring the Unit to a normal operating configuration.

1.4 This document should be referenced when the Emergency Operations Director has determined that recovery operations are necessary to perform the following activities:

1.4.1 Identify the extent of station damage and radiological contamination

1.4.2 If appropriate, return the station to an operating status in compliance with Technical Specifications

2.0 Recovery actions

2.1 Notify affected offsite emergency management organizations (via NAN) and the USNRC (via FTS-2000 ENS) that recovery operations are in progress.

2.2 Request attendance in the Emergency Operations Facility to form the Recovery Organization by assigning available management personnel per the Recovery Organization Chart. Alternates can be utilized if positions cannot be filled by prescribed management individuals.

2.3 Direct Joint Emergency News Center personnel to conduct a final news briefing for the event and to facilitate the transfer of press operations to Arizona Public Service Media Relations.

2.4 Establish recovery operations by assessing the following issues during the implementation meeting:

2.4.1 Status of plant / site conditions, accessibility to contaminated areas, the need for additional decontamination, condition of plant equipment

2.4.2 Recovery of plant buildings or areas

2.4.3 Personnel exposures

2.4.4 USNRC involvement / interface

2.4.5 Level of offsite support required

2.4.6 Assignment of work groups, tasks, staffing, etc.

2.4.7 Logistics support - documentation, information flow, etc.

2.4.8 Preliminary damage estimates

2.5 For known or suspected significant plant damage, survey teams may be formed consisting of Operations, Engineering, Maintenance, and Radiation Protection personnel to ascertain the extent of physical damage and to identify areas of contamination and high radiation. Results of the surveys should be used by the Recovery Manager, the Station Operations Manager, and the Radiological Services Manager to plan the approach for repairing and returning the Unit to operation.

2.6 Under direction of the Recovery Manager, the Recovery Organization and selected offsite personnel, if applicable, should address the planning and coordination of the recovery effort. Activities such as the maintenance and repair of existing plant systems and/or components, modifications, installations, and decontamination should be discussed, prioritized, and planned. The need for portable shielding and special procedures should be addressed, as well.

2.7 Actual recovery operations may commence upon identification and prioritization of assessed issues, finalization of the recovery plan, development of special procedures, if necessary, and allocation of adequate repair equipment. The Recovery Manager will ensure that applicable personnel are properly trained prior to implementation of recovery operations. Training material should be developed and training conducted for specialized tasks identified.

2.8 In addition to specialized requirements in place, normal Unit / plant practices shall be followed regarding maintenance, repair, modification, installation, decontamination, and personnel exposure control.

2.9 The Radiological Services Manager should develop plans to process and control radwaste, estimate total population dose on a periodic basis in conjunction with state and federal authorities, and coordinate activities of staff Radiological Engineers and Radiation Protection personnel.

2.10 The Station Operations Manager should oversee in-plant operations on a daily basis. During recovery operations, s/he will be responsible for ensuring that plant repairs and modifications optimize post-recovery plant operational effectiveness and safety. Maintenance and Work Control Management will support the Station Operations Manager with required maintenance and repair work.

2.11 The Nuclear Support Manager should focus necessary engineering and contract resources on aspects of plant recovery requiring redesign or modification.

2.12 The Technical Support Manager should provide work analyses, guidelines, and procedures in direct support of plant operations.

2.13 The Quality Assurance Manager will ensure that the overall conduct of recovery operations is performed in accordance with corporate policy and regulations governing activities which may affect the health and safety of the public.

2.14 The Administrative / Logistics Manager will supply administrative, logistic, communications, and personnel support for the recovery operation.

2.15 The PVNGS Communications Manager should coordinate the flow of information to the media concerning recovery operations.

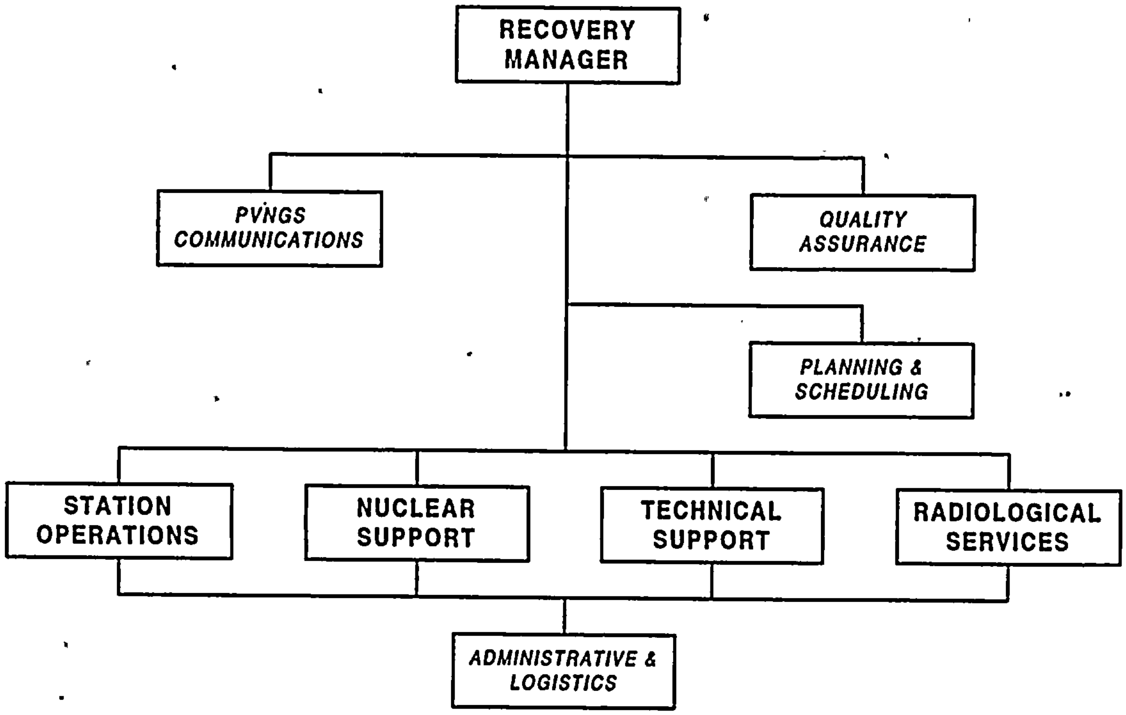
2.16 The Planning / Scheduling Manager will develop an overall schedule to guide the recovery effort.

2.17 During the course of recovery operations, unforeseen issues encountered shall be evaluated and factored into the overall recovery plan and the schedule adjusted accordingly.

2.18 Upon completion of recovery operations and prior to commencement of normal plant operations, Unit Technical Specification compliance shall be verified.

2.19 Upon completion of recovery operations, each Recovery Organization member shall submit all written documentation to the Recovery Manager, who will ensure it is forwarded to PVNGS Emergency Planning.

3.0 Recovery Organization Chart



RECOVERY ORGANIZATION	PVNGS RESPONSIBLE DEPARTMENT
RECOVERY MANAGER	EOD (Senior Vice President - Nuclear)
PVNGS COMMUNICATIONS	Strategic Communications
QUALITY ASSURANCE	Nuclear Assurance
PLANNING & SCHEDULING	Outage Department-Scheduling
STATION OPERATIONS	Operations
NUCLEAR SUPPORT	Nuclear Engineering / Projects
TECHNICAL SUPPORT	Operations Support
RADIOLOGICAL SERVICES	Radiation Protection
ADMINISTRATIVE & LOGISTICS	Nuclear Materials Management and Budgets
Italicized positions are not required as a prerequisite for formation and activation of the Recovery Organization	

Appendix Q - EAL Technical Bases

1.0 EAL TECHNICAL BASES

1.1 Introduction

1.1.1 Purpose of EAL Bases

1.1.1.1 This document was developed to provide a single source of information related to the Palo Verde Nuclear Generating Station emergency action levels. It describes the intention and technical basis for each emergency action level used to classify plant related emergencies.

1.1.1.2 Emergency action levels are plant specific indications, conditions, or instrument readings which are utilized to classify emergency conditions as defined in the PVNGS Emergency Plan. This Emergency Action Level Bases Document has been developed to facilitate the review process for revisions to the PVNGS Emergency Classification Procedure, provide historical documentation and justification for reference purposes, and to provide training to operators and decision makers that will enhance their comprehension of emergency classification.

1.1.2 Significance of EAL Bases

1.1.2.1 Not only is it necessary to know when to declare an emergency, but it is also important to know the proper level of emergency to declare. Declaration of too low an emergency classification could result in a failure to mobilize the resources necessary to deal with a degrading plant condition. Declaration of too high an emergency classification could cause unwarranted public concern and hardship. There is no single criterion which can be used to determine the exact emergency classication for a given event or plant condition. NUMARC/NESP-007 lists a number of example initiating conditions for each of the emergency classifications. All of the emergency action levels in the PVNGS Emergency Classification Procedure are based on these initiating conditions.

1.1.2.2 Emergency action levels are, for the most part, symptom based. The action level is defined by values of key plant operating parameters which identify emergency or potential emergency conditions. This approach allows the full scope of variations in the types of events to be classified as emergencies. But, a purely symptom based approach is not sufficient to address all events for which emergency classification is appropriate. Therefore, events to which no predetermined symptoms can be ascribed are also utilized as emergency action levels since they may be indicative of potentially more serious conditions not yet fully realized. Moreover, other events are selected for inclusion as emergency action levels to ensure compliance with applicable regulatory guidance, particularly Regulatory Guide 1.101.

1.1.2.3 This document ties together the aspects of emergency response implementation to the plant specific characteristics of the Palo Verde Units. By providing a detailed description of the technical basis for each action level as well as a reference to the source requirement for the action level, this document should aid those people who need to make classification decisions.

1.1.3 Scope of bases

1.1.3.1 The EALs are addressed within section 1.0 in the order by which they appear in the PVNGS Emergency Classification Procedure, each on a separate page. The page format is also explained in section 1.0. The emergency classification which should result from the initiating condition represented by the EAL is given in the upper right corner. EALs dealing with barriers or releases are usually symptom based, while others may be event oriented. The technical basis for the EAL is provided in detail, followed by references to source documents as well as NUMARC/NESP-007. In cases where PVNGS procedures were used as a reference for the technical basis, Unit 1 procedures (indicated by a "1" as the second digit of the procedure number as in 41EP-1EO01) were used to develop the technical basis. It is not anticipated that there would be differences between unit specific procedures of a magnitude or nature sufficient to affect the development of the bases. Section 1.3 contains a matrix referencing EALs from NUMARC/NESP-007 to PVNGS Emergency Classifications.

1.1.4 Regulatory requirements and guidance

1.1.4.1 The current regulatory position on nuclear power plant emergency classification methods can be found in Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50). Specifically, 10 CFR 50.47(b)(4) states: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures."

1.1.4.2 10 CFR 50 Appendix E IV (c) states: "The entire spectrum of emergency conditions that involve the alerting or activating of progressively larger segments of the total emergency organization shall be described. The communication steps to be taken to alert or activate emergency personnel under each class of emergency shall be described. Emergency action levels (based not only on onsite and offsite radiation monitoring information, but also on readings from a number of sensors that indicate a potential emergency, such as the pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described. The existence, but not the details, of a message authentication scheme shall be noted for such agencies. The emergency classes defined shall include: (1) notification of unusual events, (2) alert, (3) site area emergency, and (4) general emergency. These classes are further discussed in NUREG-0654; FEMA-REP-1."

1.1.4.3 NUREG-0654/FEMA-REP-1, Rev. 1, Planning Standard II.D., states:
"1. An emergency classification and emergency action level scheme as set forth in Appendix 1 must be established by the licensee. The specific instruments, parameters, or equipment status shall be shown for establishing each emergency class in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class.
2. The initiating conditions shall include the example conditions found in Appendix 1 and all postulated accidents in the Final Safety Analysis Report (FSAR) for the nuclear facility." Essentially, Appendix 1 of NUREG-0654 is one of the gauges to which emergency classification methods are measured. Revision 2 of Regulatory Guide 1.101, Emergency Planning and Preparedness of Nuclear Reactors, endorsed NUREG-0654.

1.1.4.4 Regulatory Guide 1.101, Revision 3 states: "The nuclear utility industry has now a decade of experience in adapting the NRC guidelines to develop sets of site-specific EALs and in using these EALs in exercises and under actual accident conditions. During this period, licensees have developed, offsite emergency response authorities have agreed upon, and the NRC has approved sets of EALs that represent broad variations in the ways the guidance in NUREG-0654 can be applied. It is possible that two plants, faced with identical conditions and applying their EAL schemes, would declare different levels of emergency (different ECLs). Also, there have been situations that were not contemplated when the guidelines were written and plant personnel were without specific guidance on which ECL to declare. ...In some cases, inconsistencies among initiating conditions together with broad ranges of risks with an initiating condition have resulted in some licensees declaring inappropriate ECLs.

In view of this experience, the Nuclear Management and Resource Council, Inc. (NUMARC) formed a task force to conduct a study to develop a systematic approach and support basis for development of emergency action levels. The methodology that was developed from this effort is described in NUMARC/NESP-007, Rev. 2, Methodology for Development of Emergency Action Levels, January 1992. NRC staff has reviewed the NUMARC methodology and considers it to be an acceptable alternative method to that described in NUREG-0654."

1.1.4.5 NUMARC/NESP-007, Revision 2 states: "This methodology develops a set of generic EAL guidelines, together with the basis for each, so that they can be used and adapted by each utility on a consistent basis. The review of the industry's experiences with EALs, in conjunction with regulatory considerations, was applied directly to the development of this generic set of EAL guidelines. The generic guidelines are intended to clearly define conditions that represent increasing risk to the public and can give consistent classifications when applied at different sites." PVNGS staff agrees with the NRC acceptance of the NUMARC methodology and adopts the guidance contained in NUMARC/NESP-007 as an alternative method to that described in NUREG-0654 for the development of emergency action levels (EALs).

1.1.5 Fission Product Barrier EAL Criteria

1.1.5.1 PVNGS Emergency Action Levels formulated according to the barrier based classification philosophy. As such, the ultimate emergency classification resulting from following PVNGS Emergency Action Levels will be based on combinations of EALS. These combinations are compiled using Table 4 of NUMARC/NESP-007 and are based on the following barrier criteria:

1. Notification of Unusual Event (NUE)

   Any loss OR any potential loss of Containment

2. Alert (ALERT)

   Any loss OR any potential loss of either Fuel Clad or RCS

3. Site Area Emergency (SAE)

   Loss of both Fuel Clad and RCS

   OR Potential loss of both Fuel Clad and RCS

   OR Potential loss of either Fuel Clad or RCS AND loss of any additional barrier

4. General Emergency (GE)

   Loss of any two barriers

   AND Potential loss of a third barrier

1.1.5.2 Although the logic used for the initiating conditions in PVNGS Emergency Action Levels appears overly complex, it is necessary to reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier. Notification of Unusual Event (NUE) initiating conditions associated with Fuel Clad and RCS Barriers are addressed under the LEAKAGE and MALFUNCTION Emergency Action Levels in PVNGS Emergency Action Levels.
- At the Site Area Emergency (SAE) level, there must be some ability to dynamically assess how far present conditions are from General Emergency. If Fuel Clad Barrier and RCS Barrier "Loss" EALs existed, this would indicate to the Emergency Operations Director (EOD) that, in addition to offsite dose assessments, continual assessments of radioactive inventory and containment integrity must be focused on. However, if both Fuel Clad Barrier and RCS Barrier "Potential Loss" EALs existed, the EOD would have more assurance that there was no immediate need to escalate to a General Emergency (GE).
- The ability to escalate to higher emergency classification levels as an event gets worse must be maintained. For example, RCS leakage steadily increasing would represent an increasing risk to public health and safety.

1.1.5.3 If a "Potential Loss" or "Loss" of a barrier in PVNGS Emergency Action Levels appears imminent (i.e., within 1 to 2 hours), a classification should be made as if the affected threshold(s) are already exceeded, particularly for the higher emergency classification levels.

1.2 Classification Criteria

1.2.1 Classification Criteria preface

1.2.1.1 NUREG-0654 FEMA REP-1 provides the definitions of each of the four emergency classifications as well as example initiating conditions which are indicative of each. The definitions provided in NUREG-0654 FEMA REP-1 are somewhat ambiguous in application and the example initiating events are not symptomatically definable or applicable in all cases.

1.2.1.2 There are three considerations related to emergency classification levels:

1. The potential impact on radiological safety, either as now known or as can be reasonably projected.
2. How far the plant is beyond its predefined design, safety, and operating envelopes.
3. Whether or not conditions that threaten health are expected to be confined to within the site boundary.

1.2.1.3 The following pages incorporate the four emergency classification level definitions as delineated within NUREG-0654. Additional discussion is provided on threshold determinations to eliminate ambiguities and to help clarify the intent of each of the emergency classification levels.

1.2.2 Notification of Unusual Event (NUE)

1.2.2.1 "Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occur."

1.2.2.2 Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant technical specification Limiting Condition for Operation (LCO) allowable action statement time for achieving required mode change. Precursors of more serious events should also be included because precursors do represent a potential degradation in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency classification level, however, releases do not require monitoring or offsite response (e.g., dose consequences of less than 10 millirem).

1.2.3 Alert

1.2.3.1 "Events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guideline exposure levels."

1.2.3.2 Rather than discussing the distinguishing features of "potential degradation" and "potential substantial degradation", a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency classification level is warranted, or whether de-escalation or termination of the emergency classification declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels (i.e., about 10 millirem to 100 millirem).

1.2.4 Site Area Emergency (SAE)

1.2.4.1 "Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels except near the site boundary."

1.2.4.2 The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines of NUMARC/NESP-007, clearly addresses NRC and offsite emergency response agency concerns as to timely declaration of a General Emergency.

1.2.5 General Emergency (GE)

1.2.5.1 "Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area."

1.2.5.2 The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore should be interpreted to include radionuclide release regardless of cause. In addition, it should address concerns as to uncertainties in systems or structures, e.g., containment, response, and also events such as waste gas tank releases and severe spent fuel pool events postulated to occur at high population density sites. To better assure timely notification, EALs in this category must primarily be expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with potential loss of the third barrier constitutes a General Emergency.

1.3 NUMARC/PVNGS EAL Matrix

1.3.1 EAL Matrix Preface

1.3.1.1 NUMARC/NESP-007 provides information by Recognition Categories in the following outline:

- A - Abnormal Rad Levels / Radiological Effluent
- F - Fission Product Barrier Degradation
- H - Hazards and Other Conditions Affecting Plant Safety
- S - System Malfunction

1.3.1.2 Within NUMARC/NESP-007, the initiating conditions for each of the Recognition Categories A, H, and S are in the order of Unusual Event, Alert, Site Area Emergency, and General Emergency. For Recognition Category F, the barrier-based EALs are presented in Table 4 (PWR).

1.3.1.3 PVNGS, as delineated in Emergency Action Levels and this EAL Technical Bases document, takes a like approach insofar as emergency classification order is concerned. However, PVNGS Emergency Action Level Event Categories have been outlined in a manner consistent with past practices due to human factors considerations. PVNGS Emergency Action Level Event Categories conform to NUMARC/NESP-007 criteria with the exception that PVNGS Emergency Action Levels further detail the EALs categorically. PVNGS Emergency Action Levels incorporate NUMARC/NESP-007 Recognition Category F as the Fission Product Barrier Reference. This layout is equivalent to the PWR-Table 4 of NUMARC/NESP-007 with the exception that the sub-columns and associated EALs for "Loss" and "Potential Loss" have been transposed due to human factors considerations. The three remaining NUMARC/NESP-007 Recognition Categories (i.e., A, H, S) are directly related to the seven PVNGS Event Categories under the following regime and comprise the rest of the PVNGS Emergency Action Levels :

- Electrical
- Radiological
- Leakage
- Malfunctions
- Hazards
- Security
- Miscellaneous

1.3.1.4 The matrix is entitled NUMARC/NESP-007 to PVNGS EAL Cross-Reference, where entries are categorized and sequenced according to NUMARC/NESP-007. This arrangement applies to Recognition Category sequence as well as emergency classification level hierarchy. A relation to the PVNGS Emergency Action Level Technical Bases can be found within the tables of PVNGS Emergency Action Levels, where the PVNGS EAL Identification Code associated with each EAL is embedded within each respective EAL Unit and corresponds to the PVNGS EAL Technical Bases number where the basis for the particular Emergency Action Level can be found. The matrix, together with PVNGS Emergency Action Levels, is intended to provide for an uncomplicated method to quickly relate EALs from one document to their counterparts in the other.

1.3.1.5 Specific NUMARC/NESP-007 Emergency Action Levels cross-referenced as "N/A" within the following tables signify no applicability of the generic EAL to PVNGS. These items are noted as exclusions to NUMARC/NESP-007 and are catalogued in section 1.4 of this document along with a basis for each exclusion.

1.3.2 EAL Matrix

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AU1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-3	N/A			
AU1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AU2-1	Table 3:	RADIOLOGICAL:		Row 6
AU2-2	Table 3:	RADIOLOGICAL:		Row 6
AU2-3	N/A			
AU2-4	Table 3:	RADIOLOGICAL:		Row 5

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
AA1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-3	N/A			
AA1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AA2-1	Table 3:	RADIOLOGICAL:		Row 6
AA2-2	Table 3:	RADIOLOGICAL:		Row 6
AA2-3	Table 3:	RADIOLOGICAL:		Row 6
AA2-4	Table 3:	RADIOLOGICAL:		Row 6
AA3-1	Table 3:	RADIOLOGICAL:		Row 6
AA3-2	Table 3:	RADIOLOGICAL:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AS1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AS1-2	N/A			
AS1-3	Table 3:	RADIOLOGICAL:		Row 4
AS1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AG1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AG1-2	N/A			
AG1-3	Table 3:	RADIOLOGICAL:		Row 4
AG1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - FUEL CLAD BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	Fuel Clad:		Row 2
3	Table 1:	Fuel Clad:		Row 1
4	Table 1:	Fuel Clad:		Row 2
5	Table 1:	Fuel Clad:		Row 3
6	N/A			
7	Table 1:	Fuel Clad:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - RCS BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	RCS:		Row 1
3	Table 1:	RCS:		Row 2
4	N/A			
5	Table 1:	RCS:		Row 3
6	Table 1:	RCS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - CONTAINMENT BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	CTMT:		Row 1, Row 2, Row 4
3	Table 1:	CTMT:		Row 3
4	Table 1:	CTMT:		Row 4
5	Table 1:	CTMT:		Row 3
6	Table 1:	CTMT:		Row 5
7	N/A			
8	Table 1:	CTMT:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HU1-1	Table 2:	HAZARDS		Row 7
HU1-2	Table 2:	HAZARDS		Row 8
HU1-3	Table 2:	MISCELLANEOUS:		Row 1
HU1-4	Table 2:	HAZARDS		Row 4
HU1-5	Table 2:	HAZARDS:		Row 2
HU1-6	Table 2:	HAZARDS:		Row 6
HU1-7	Table 2:	HAZARDS:		Row 9
HU2-1	Table 2:	HAZARDS:		Row 1
HU3-1	Table 2:	HAZARDS:		Row 5
HU3-2	Table 2:	HAZARDS:		Row 5
HU4-1	Table 2:	SECURITY:		Row 1
HU4-2	Table 2:	SECURITY:		Row 1
HU5-1	Table 2:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
HA1-1	Table 6:	HAZARDS:		Row 7
HA1-2	Table 6:	HAZARDS:		Row 8
HA1-3	Table 6:	HAZARDS:		Row 4
HA1-4	Table 8:	MISCELLANEOUS:		Row 1
HA1-5	Table 6:	HAZARDS:		Row 3
HA1-6	Table 6:	HAZARDS:		Row 6
HA1-7	Table 6:	HAZARDS:		Row 9
HA2-1	Table 6:	HAZARDS:		Row 1
HA3-1	Table 6:	HAZARDS:		Row 5
HA3-2	Table 6:	HAZARDS		Row 5
HA4-1	Table 7:	SECURITY:		Row 1
HA4-2	Table 7:	SECURITY:		Row 1
HA5-1	Table 6:	HAZARDS:		Row 2
HA6-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HS1-1	Table 7:	SECURITY:		Row 1
HS1-2	Table 7:	SECURITY:		Row 1
HS2-1	Table 6:	HAZARDS:		Row 2
HS3-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HG1-1	Table 7:	SECURITY:		Row 1
HG1-2	Table 7:	SECURITY:		Row 1
HG2-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SU1-1	Table 2:	ELECTRICAL:		Row 1
SU2-1	Table 5:	MALFUNCTIONS:		Row 4
SU3-1	Table 5:	MALFUNCTIONS:		Row 3
SU4-1	N/A			
SU4-2	Table 3:	RADIOLOGICAL:		Row 7
SU5-1	Table 4:	LEAKAGE:		Row 1, Row 2
SU6-1	Table 5:	MALFUNCTIONS:		Row 5, Row 6
SU7-1	Table 2:	ELECTRICAL:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
SA1-1	Table 2:	ELECTRICAL:		Row 2
SA2-1	Table 5:	MALFUNCTIONS:		Row 1
SA3-1	Table 5:	MALFUNCTIONS:		Row 2
SA4-1	Table 5:	MALFUNCTIONS:		Row 3
SA5-1	Table 2:	ELECTRICAL:		Row 1

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SS1-1	Table 2:	ELECTRICAL:		Row 1
SS2-1	Table 5:	MALFUNCTIONS:		Row 1
SS3-1	Table 2:	ELECTRICAL:		Row 3
SS4-1	Table 5:	MALFUNCTIONS:		Row 3
SS5-1	Table 5:	MALFUNCTIONS:		Row 2
SS6-1	Table 5:	MALFUNCTIONS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SG1-1	Table 2:	ELECTRICAL:		Row 1
SG2-1	Table 5:	MALFUNCTIONS:		Row 1

1.4 Exclusions to NUMARC/NESP-007

The EALs in the EXCLUSIONS TO NUMARC/NESP-007 Section are addressed ***in the order by which they appear in NUMARC/NESP-007*** and the basis and justification for exclusion of each NUMARC EAL will begin on a new page. The format of each page will comply with the following regime:

APP MODE: MODES x - x

CLASS: xxxxx

CATEGORY: [A, F, H, S] *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

EXCLUSIONARY BASIS:

(The full technical basis supporting the exclusion of the EAL from PVNGS Emergency Action Levels and any other information and/or justification regarding the basis)

SOURCE DOCUMENT:

(The source document(s) used as reference for the exclusionary basis)

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.

3. Valid reading on perimeter radiation monitoring system greater than 0.10 mR/hr above normal background for 60 minutes [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AU1-1, AU1-2, and AU1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6	*CLASS:* NUE
CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent	

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected Increase in Plant Radiation or Airborne Concentration.
3. (Site-specific) radiation reading for irradiated spent fuel in dry storage.

EXCLUSIONARY BASIS:

PVNGS does not incorporate spent fuel dry storage facilities in its design. Reliance on spent fuel temporary storage capabilities is accomplished in the Spent Fuel Pool and is addressed by AU2-1, AU2-2, and AU2-4. This EAL is excluded from the PVNGS EAL scheme because no spent fuel dry storage modules exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: **MODES 1 - 6** ***CLASS:*** **ALERT**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.

3. A valid reading on perimeter radiation monitoring system greater than 10.0 mR/hr sustained for 15 minutes or longer [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AA1-1, AA1-2, and AA1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6	CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 100 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AS1-1, AS1-3, and AS1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6	CLASS: GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 1000 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AG1-1, AG1-3, and AG1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Fuel Clad Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Fuel Clad Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	*CLASS:* N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

6. Other (Site-Specific) Indications (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Fuel Clad Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of RCS Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the RCS Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

***APP MODE*:** MODES 1 - 4

***CLASS*:** N/A

***CATEGORY*:** [F] Fission Product Barrier Degradation

***NUMARC/NESP-007 INITIATING CONDITION*:**

4. Containment Radiation Monitoring (RCS Barrier)

***EXCLUSIONARY BASIS*:**

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

Two other radiation monitors, RU-148 and RU-149, which are the containment high range area monitors, would indicate off-scale LO readings under conditions warranting use of radiation monitoring when the reactor coolant noble gas and iodine inventory associated with normal operating concentrations *(i.e., within Tech Specs)* are assumed to be instantaneously released and dispersed into containment.

***SOURCE DOCUMENT*:**

PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	***CLASS:*** N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Containment Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Containment Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Containment Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	*CLASS:* N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

7. Other (Site-Specific) Indications (Containment Barrier)

EXCLUSIONARY BASIS:

This EAL encompasses other site-specific indications which could be used to signify a "Loss" or "Potential Loss" of the Containment Barrier. Specifically addressed are area or ventilation monitors in the containment "annulus" or other contiguous buildings. PVNGS Emergency Operating Procedures do not provide for containment venting as a method utilized to preclude conditions where a potential loss or loss of the containment barrier could occur. Under these conditions, the hydrogen recombiners would be put into service some 100 hours subsequent to a loss of coolant accident *(LOCA)* for purposes of addressing the potential hydrogen problem which may result from the LOCA. Containment venting is only performed during normal routine plant operations.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Containment Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.

1. (Site-Specific) radiation monitor readings indicating fuel clad degradation greater than Technical Specification allowable limits.

EXCLUSIONARY BASIS:

This EAL is not applicable to PVNGS due to incorporation of no failed fuel monitor within its design. However, RCS Letdown Radiation Monitor, RU-155D, is used for trend analysis in determining changes in RCS activity which would denote changes in fuel clad integrity. It is neither Technical Specification related nor is it to be used for quantification of fuel clad degradation. The sole function of RU-155D is to provide trend data as a basis for RCS sampling frequency.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
Engineering Calculation 13-JC-SQ-215, RE-155D, Total Loop Uncertainty and Setpoint, Rev. 0
PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 2
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 00.10
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5 PVNGS EAL Technical Bases

1.5.1 Introduction

The EALs in the Technical Bases Section are addressed on the following pages, ***not necessarily in the order by which they appear in Tables 1 through 8 of the procedure,*** and the technical composition for each will begin on a new page. The format of each page will comply with the following regime:

APP MODE: MODES x - x

CLASS: xxxxx

CATEGORY: [A, F, H, S] *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

PVNGS EMERGENCY ACTION LEVEL (EAL):

(The PVNGS specific EAL as presented in PVNGS Procedures)

LOCATION: PVNGS Emergency Action Levels - Table (1 through 8): (Category, Row)

TECHNICAL BASIS:

(The technical basis supporting the EAL as stated)

NUMARC DEVIATION:

(The deviation(s) to the NUMARC/NESP-007 EAL and justification)

SOURCE DOCUMENT:

(The source document(s) used as reference for the basis and deviation justifications)

(EAL number)

n-n

1.5.2 1-1

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: **[F]** Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Core Exit Thermocouple Readings

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Highest valid CET temperature > 700°F*

LOSS: *Highest valid CET temperature > 1200°F*

LOCATION: Table 1: FUEL CLAD / Row 1

TECHNICAL BASIS:

Maximum allowed RCS pressure is 2750 psia per PVNGS Technical Specifications Section 2.1.2. Maximum instrument error *(specified in 41EP-1EO01 Appendix S)* for RCX-PT-102x, wide range pressurizer pressure instrument, is ± 390 psi. Maximum actual system pressure is 3140 psia for an indicated pressure of 2750 psia. Saturation temperature for this pressure is 702°F. If one or more CETs indicate 700°F or higher, subcooling has been lost for at least some locations in the core. CET indications at or above 700°F are a clear sign that core heat removal capability is lost or greatly reduced and one fission product barrier, the fuel clad, is threatened due to elevated fuel temperatures. 700°F qualifies as a condition representing a "Potential Loss" of the Fuel Clad Barrier.

The 1200°F temperature constitutes a "Loss" of the Fuel Clad Barrier per NUMARC/NESP-007, Rev. 2. It indicates significant superheating of the coolant.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10, Appendix S, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-1

1.5.3 1-2 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: **[F]** Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Reactor Vessel Water Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RVLMS level < 21% plenum*

LOSS: *N/A*

LOCATION: Table 1: FUEL CLAD / Row 2.

TECHNICAL BASIS:

Steam voids may form in the reactor vessel [outlet] plenum as a result of inventory loss, pressure drop, or inadequate heat removal from the core when core temperatures exceed saturation for RCS pressure following a reactor trip. During this period, cooling is typically via natural circulation. If void size cannot be controlled and the void extends into the reactor vessel outlet plenum, the heat removal process shifts from subcooled natural circulation to less efficient and non-preferred reflux boiling. Any indication of void formation requires immediate attention to control and/or reduce the size of the void and to maintain RCS heat removal capability. Voiding in the outlet plenum is most likely caused by loss of inventory or by loss of pressure control in the RCS. In either case, the fuel clad is threatened with perforation due to elevated centerline temperatures from the lower heat removal capability of reflux boiling compared to natural circulation.

The Reactor Vessel Level Monitoring System *(RVLMS)* is comprised of eight Heated Junction Thermocouples *(HJTC)* oriented vertically above the upper Fuel Alignment Plate *(FAP)* in the reactor vessel. As head and outlet plenum *(hot leg)* levels decrease, HJTCs begin to become uncovered, causing indicated temperatures for the affected HJTCs to rise as temperatures approach saturated conditions during development of the steam void. Indicated levels read out as incremental values on 1E Class instrumentation in the Control Room.

1-2

1.5.4 1-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Corresponding detector numbers and their respective indicated readings are as follows:

Detector Number Meter Reading

1 *(uncovered)* 67% head
2 *(uncovered)* 41% head
3 *(uncovered)* 16% head
4 *(uncovered)* 0% head
5 *(uncovered)* 73% plenum
6 *(uncovered)* 47% plenum
7 *(uncovered)* 21% plenum
8 *(uncovered)* 0% plenum

As can be seen, once Detector 8 becomes uncovered and detects saturated conditions, indicated level will proceed from 21% plenum to 0% plenum. From this point on, as vessel level continues to lower, it can no longer be discerned as to where actual reactor vessel water level is. The value chosen in this EAL conforms to the generic basis in that "< 21% plenum" indicates a potential loss of the Fuel Clad Barrier, as actual water level may be at the top of the active fuel, or below.

NUMARC DEVIATION:

While actual reactor vessel water level may be above the active region of the fuel after indicated water level reaches "0", it can no longer be determined exactly where actual level is when level continues to decrease. Conservatively, an assumption must be made at the time that vessel water level is AT the top of the active fuel.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ54, Monitoring the Reactor Vessel Inventory with RVLMS Inoperable, Rev. 01.02
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.5 1-3

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Primary Coolant Activity Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *RCS activity > 300 µCi/gm Dose Equivalent I-131*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Due to the likelihood of fuel damage during an ATWS caused by fuel overheat due to either mechanical binding of stuck CEAs or Reactor Trip Switchgear Breaker failure, this EAL would be met if a chemistry sample analysis indicated that fuel damage exists, as signified by Dose Equivalent Iodine^{131} exceeding 300 µCi/gm. This amount of coolant activity is well above that expected for Iodine spikes and corresponds to about 2% to 5% fuel clad damage, which indicates significant clad heating. Thus, the Fuel Clad Barrier is considered lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-3

1.5.6 1-4

APP MODE: MODES 1 - 4	***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Containment Radiation Monitoring

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr or RU-149 > 1.8E+06 mrem/hr*

LOCATION: Table 1: FUEL CLAD / Row 3

TECHNICAL BASIS:

The containment HI range area monitors, RU-148 and RU-149, provide radiation accident condition information inside containment. Bechtel Calculation 13-NC-ZY-216 provides a basis to correlate the readings from RU-148/RU-149 to a Core Damage Fraction *(CDF)*. The calculation uses CESSAR Table 15.6.5-1 for Source Term and assumes that 100% of the Equilibrium Noble Gas and 25% of the Equilibrium Iodine are airborne in containment. Per this calculation, a CDF of 1% equates to readings of 1.2E+06 mrem/hr on RU-148 and 1.8E+06 mrem/hr on RU-149 and is based on 300 μCi/gm Dose Equivalent Iodine^{131} in the containment atmosphere. An assumption in the calculation consists of a reactor shutdown 15 minutes ago, yielding an effective age of 0.25 hours. The corresponding readings for both radiation monitors differ slightly due to their respective physical locations within containment.

NUMARC DEVIATION:

NUMARC/NESP-007 specifies these values should be based on an "approximate" clad failure of 2%-5%, depending on core inventory and RCS volume. Cores associated with the PVNGS Units are larger than normal and the Bechtel Calculation assumes 1% clad failure with a LOCA to arrive at the values given for this EAL.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Procedure 74CH-9ZZ87, Iodine-131 Dose Equivalent Determination, Rev. 2
PVNGS Unit 1 Technical Specifications, Amendment 74
Bechtel Calculation 13-NC-ZY-216, Rev. 1
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Table 15.6.5-1
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-4

1.5.7 1-5

APP MODE: MODES 1 - 4 ***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

7. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier*

LOCATION: Table 1: FUEL CLAD / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Fuel Clad Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-5

1.5.8 1-6 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: **[F] Fission Product Barrier Degradation**

NUMARC/NESP-007 INITIATING CONDITION:

2. RCS Leak Rate

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RCS leak > 44 gpm*

LOSS: *RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling (i.e., RCS at saturation conditions)*

LOCATION: Table 1: RCS / Row 1

TECHNICAL BASIS:

RCS leakage is the flow of any reactor coolant out through the RCS pressure boundary to any location by a means other than design flow or drainage of coolant as part of an authorized procedure. It may be detected by any or all of the following means:

- Increasing containment radiation levels or airborne activity levels.
- Increasing containment sump levels, temperature, pressure, or humidity.
- Increasing steam generator blowdown radiation levels or steam line radiation levels or steam generator activity.
- Increasing radiation levels, airborne activity levels, or sump levels in the auxiliary building.
- Decreasing RCS pressure or pressurizer level *(with no other transient in progress).*
- Reactor Coolant System leak rate determination.

Measurement of the rate may be made by an RCS inventory balance *(conducted at least every 72 hours in accordance with 40ST-9RC02, RCS Water Inventory Balance, or as part of Procedure 41EP-1RO02, Loss of Coolant Accident)* or by observation that pressurizer level continues to decrease with letdown isolated and one charging pump running in a normal configuration.

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any RCS leakage which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of RCS subcooling has occurred. The loss of RCS subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

1-6

1.5.9 1-6 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.10 1-7 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. SG Tube Rupture

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *SGTR leak > 44 gpm*

LOSS: *SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1)*

LOCATION: Table 1: RCS / Row 2

TECHNICAL BASIS:

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any SGTR event which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses ruptured S/Gs with an unisolable secondary line break corresponding to the loss of the RCS Barrier and the Containment Barrier. *(NOTE: the Containment Barrier loss is represented by the "Secondary Side Release with Primary-to-Secondary Leakage" EAL.)* This allows the direct release of radioactive fission and activation products to the environment. Since actual leak rate is a function of the offsite dose rates attainable for this event, 132 gpm is consistent with the diagnostic activities of the applicable Emergency Operating Procedure *(i.e., 41EP-1RO03, Steam Generator Tube Rupture).* This includes indication of a primary coolant inventory reduction and increased secondary radiation levels. 41EP-1RO08, Functional Recovery, would be the applicable procedure for a SGTR along with an uncontrolled or complete depressurization of the ruptured S/G. Secondary radiation increases are observed via radiation monitoring of condenser off-gas, S/G blowdown; main steam, and/or S/G sampling. Determination of the "uncontrolled" depressurization of the ruptured S/G is based on indication that the pressure decrease in the ruptured S/G is not a function of normal operator actions. The Limitations Topic Area in PVNGS Emergency Action Levels, qualifies this part of the event. Emergency Operating Procedures direct the subsequent plant cooldown to take place utilizing steaming of the unaffected S/G. The "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization due to the same effect this action has on offsite dose rates in relation to dose rates caused by steam line breaks or stuck open S/G safety valve*(s).*

1-7

1.5.11 1-7 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance with the exception of where the "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization, as referenced in the PVNGS Emergency Action Levels. This condition would involve a prolonged release of contaminated secondary coolant from the affected S/G to the environment if that affected S/G is utilized for plant cooldown to Mode 5 *(Cold Shutdown)* because plant Emergency Operating Procedures direct plant cooldown via steaming of the unaffected S/G to the condenser, which is the preferred path.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO03, Steam Generator Tube Rupture, Rev. 00.08
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.12 1-8

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Other (Site-Specific) Indications

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *LOAF such that minimum acceptable feedwater flow cannot be maintained*

LOSS: *N/A*

LOCATION: Table 1: RCS / Row 3

TECHNICAL BASIS:

This EAL addresses the inability to initially remove heat from the RCS during early stages of an event, thereby jeopardizing the Heat Removal Safety Function. If emergency auxiliary feedwater flow *(and main feedwater flow)* required by design is insufficient to remove the amount of heat from at least one steam generator, an extreme challenge should be considered to exist and the RCS Barrier is potentially lost. Procedure 41EP-1RO05, Loss of All Feedwater, includes provisions for establishing feedwater flow to the S/G*(s)* under conditions where no flow could be established from the Control Room. A potential loss of the RCS Barrier exists if actions from outside the Control Room are required to establish or maintain minimum acceptable feedwater flow and all attempts from the Control Room to establish or maintain acceptable feedwater flow have been exhausted.

NUMARC DEVIATION:

This "Potential Loss" EAL meets the NUMARC/NESP-007 intent of other indications. The EAL includes a Control Room diagnosis that a loss of all feedwater condition exists with indications that feedwater flow to at least one S/G cannot be initiated or maintained from the Control Room.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO05, Loss of All Feedwater, Rev. 00.07
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-8

1.5.13 1-9

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier*

LOCATION: Table 1: RCS / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the RCS Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-9

1.5.14 1-10 (page 1 of 2)

APP MODE: MODES 1 - 4 — *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Containment Pressure

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Row 1: CTMT pressure 50 psig and increasing*
Row 2: CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating
Row 5: H_2 concentration > 3.5% by volume

LOSS: *Row 1: Rapid unexplained CTMT pressure decrease following initial increase*
Row 2: CTMT pressure or sump level response not consistent with LOCA conditions

LOCATION: Table 1: CONTAINMENT / Row 1, Row 2, Row 4

TECHNICAL BASIS:

The only likely cause for a pressure excursion in containment at or exceeding 50 psig is a LOCA with failure of containment pressure control systems. CIAS setpoint is 3 psig. Containment Spray setpoint *(CSAS)* is 8.5 psig. In order for containment pressure to reach 50 psig, both Containment Spray trains must have already failed. Maximum allowed containment pressure by Technical Specifications is 2.5 psig. Design pressure is 60 psig. The proximity of containment pressure to design pressure, in combination with probable elevated containment air temperatures in the case of a LOCA and the demonstrated inability to control containment pressure, make the failure of containment likely. This "Potential Loss" EAL is included in PVNGS Emergency Action Levels to provide clear indication that containment integrity is threatened and to provide for a path of further escalation in the case of one or two fission product barriers already lost or threatened.

The likely source of hydrogen in containment is a LOCA into containment accompanied by severe fuel melt. A metal-water reaction of the zircalloy clad produces hydrogen in the core, which is then released into containment. Other possible sources include: radiolytic decomposition of post-LOCA emergency cooling solutions or corrosion of metals and paints by emergency cooling containment spray solutions. The conservative approach assumes that severe core damage is the source. Core damage and leakage of this magnitude clearly indicate a failure of two fission product barriers. Hydrogen levels of this magnitude in containment would likely be accompanied by elevated containment pressure and, with hydrogen approaching the lower flammable limit of 4%, would threaten containment integrity with a further pressure spike from a hydrogen burn. Rapid unexplained loss of containment pressure which is not directly attributable to containment spray or condensation effects following an initial pressure increase indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

1-10

1.5.15 1-10 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUREG/BR-0150, USNRC RTM-92, Response Technical Manual, Volume 1 Rev. 2, October 1992
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.16 1-11

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Significant Radioactive Inventory In Containment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr or RU-149 > 8.7E+09 mrem/hr*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The readings associated with RU-148 and RU-149 are values which indicate significant fuel damage well in excess of the EAL associated with loss of the Fuel Clad Barrier. A major release of radioactivity requiring offsite protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant. Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a "Potential Loss" of containment, such that a General Emergency declaration is warranted. NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates that such conditions do not exist when the amount of clad damage is less than 20%. Hence, these radiation monitor readings correspond to 20% fuel clad damage.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-11

1.5.17 1-12

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: **[F] Fission Product Barrier Degradation**

NUMARC/NESP-007 INITIATING CONDITION:

6. Core Exit Thermocouples

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored w/i 15 min.*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 5

TECHNICAL BASIS:

Restoration implied in the EAL assumes that function restoration procedures are considered effective if temperatures are decreasing or if vessel water level is increasing. The conditions mentioned in the EAL represent a core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with CET EALs in the Fuel Clad Barrier and leakages in the RCS Barrier, this EAL would result in the declaration of a General Emergency. There exists no success path for this event if function restoration procedures are ineffective.

Severe accident analyses *(e.g., NUREG-1150)* have concluded that function restoration procedures can arrest core degradation within the reactor vessel in a significant fraction of the core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period to allow function restoration procedures to arrest the core melt sequence. Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Operations Director/Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be, ineffective. The reactor vessel level identified in the EAL is consistent with application to PVNGS. *(See the Technical Basis for the Fuel Clad Barrier "Potential Loss" EAL on reactor vessel water level.)*

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-12

1.5.18 1-13

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Containment Isolation Valve Status After Containment Isolation

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The PVNGS setpoint for a Containment Isolation Actuation Signal *(CIAS)* is 3.0 psig containment pressure. The likely cause for elevated containment pressure is a LOCA into containment. The containment atmosphere will be contaminated to some degree by activity from the RCS. If both containment isolation valves which are required to close on a CIAS do not fully close, there will be an unmonitored release to the environment from the containment if it is determined that a downstream pathway to the environment exists. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

This EAL addresses an incomplete containment isolation that allows a direct release to the environment. It represents a loss of the Containment Barrier.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-13

1.5.19 1-14

APP MODE: MODES 1 - 4	***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

4. SG Secondary Side Release With Primary To Secondary Leakage

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Release of contam. secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage*

LOCATION: Table 1: CONTAINMENT / Row 4

TECHNICAL BASIS:

The "Loss" EAL is based on steam generator tube leakage in excess of Tech Spec allowable S/G primary-to-secondary leakage in combination with a release of contaminated steam to the environment. Steam release may be due to a steam line break. It may also be due to operation of the main steam safety or atmospheric dump valves *(ADVs)*, or turbine-driven AF pump exhaust. These methods may release steam to the environment as a normal factor of operation. In the case of a steam line break, the leakage to the environment may not be isolable. If the release of steam is from turbine-driven AF pump exhaust, isolation will likely result in loss of steam generator feed with eventual loss of core cooling as the steam generators boil dry. The Main Steam safety or atmospheric dump valves are commonly used as a primary means of RCS heat removal during post-trip natural circulation cooling of the core. Under these conditions, a release of steam from the Main Steam safety or atmospheric dump valves cannot be isolated without loss of core cooling or risking a possible overpressure condition in the steam generators. It is likely that there will be some contamination of the steam released to the environment by leakage from the primary coolant system. This release will be unmonitored. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ08, Steam Generator Tube Leak, Rev. 00.08
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-14

1.5.20 1-15

APP MODE: MODES 1 - 4	CLASS: N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

8. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier*

LOCATION: Table 1: CONTAINMENT / Row 6

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Containment Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-15

1.5.21 2-1

APP MODE: MODES 1 - 6 | *CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU1 Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers for greater than 15 minutes.
AND
b. At least (site-specific) emergency generators are supplying power to emergency busses.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power *(Station Blackout).* Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-1

1.5.22 2-2 (page 1 of 2)

APP MODE: MODES 5 - 6, Defueled	***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU7 Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for Greater Than 15 Minutes.
1. Either of the following conditions exist:
a. Unplanned loss of Vital DC power to required DC busses based on (site-specific) bus voltage indications.
AND
b. Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

The purpose of this EAL is to recognize a loss of DC power compromising the ability to monitor and control the removal of decay heat during Cold Shutdown or Refueling operations. This EAL is anticipatory in as much as the operating crew may not have necessary indication and control of equipment needed to respond to the loss. "Unplanned" is included in this EAL to preclude the declaration of an emergency as a result of planned maintenance activities. The intention is that the loss of the operating *(OPERABLE)* train is to be considered when the other redundant train may be out of service.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

2-2

1.5.23 2-2 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation.13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.24 2-3 (page 1 of 2)

APP MODE: MODES 1 - 4 — ***CLASS:*** ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA5 AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout.
1. Either of the following conditions exist: (a and b)
a. Loss of Power to <site-specific> Transformers for Greater Than 15 Minutes, AND
b. Onsite Power Capability has been Degraded to one (Train of) Emergency Bus(ses) Powered From a Single Onsite Power Source due to the Loss of: <site-specific list>

PVNGS EMERGENCY ACTION LEVEL (EAL):
Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition:

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG)
OR
Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR)

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:
This EAL is intended to provide an escalation from EAL [SU1-1]. The condition indicated is the degradation of the offsite and onsite power systems such that any additional single failure would result in a total loss of power to both essential buses. This condition could occur due to a loss of offsite power with a concurrent failure of one emergency diesel generator to supply power to its respective emergency bus. Another related condition could be the loss of all offsite power to the essential buses from the ESF Transformers and loss of both emergency diesel generators with only one train of emergency buses being backfed from the unit main generator, or the loss of both emergency diesel generators with only one train of emergency buses being backfed from offsite power. The subsequent loss of this single power source would escalate the event to an SAE in accordance with EAL [SS1-1]. Control Room indications representing this condition would be all power supplies to both essential buses unavailable except for a single power source such that if lost, would establish the single failure vulnerability. Since PVNGS is a multi-unit site, credit is allowed for a cross-tie of another unit's emergency diesel generator, provided that the evolution is being directed by plant procedures. However, the impact of this condition on other safety functions must be considered.

2-3

1.5.25 2-3 (page 2 of 2)

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

This EAL does not address specific Control Room annunciator indications for this condition due to the inconsistencies associated with it. Control Room annunciation is utilized in analyzing the condition, as directed by plant annunciator response procedures which direct subsequent actions based on priorities established within those procedures.

SOURCE DOCUMENT:

41AL-1RK1A, Panel B01A Alarm Responses, Rev. 03.01
41AL-1RK1B, Panel B01B Alarm Responses, Rev. 02.08
41AL-1RK1C, Panel B01C Alarm Responses, Rev. 03.19
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.26 2-4

APP MODE: MODES 5 - 6, Defueled	***CLASS:*** ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses During Cold Shutdown Or Refueling Mode.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within 15 minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:
Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. When in Cold Shutdown, Refueling, or a Defueled Mode, the event can be classified as an ALERT because of the significantly reduced decay heat, lower RCS temperature and pressure, and the increased time to restore one of the emergency buses relative to that specified for the SAE EAL. Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:
The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-4

1.5.27 2-5

APP MODE: MODES 1 - 4 | *CLASS:* SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within (site-specific) minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP).* Prolonged loss of all AC power will cause core uncovering and loss of containment integrity. Thus, this event can escalate to a General Emergency. The fifteen minute time duration is selected to exclude transient and momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-5

1.5.28 2-6

APP MODE: MODES 1 - 4	*CLASS:* SAE
CATEGORY: [S] System Malfunction	

NUMARC/NESP-007 INITIATING CONDITION:

SS3 Loss of All Vital DC Power.
1. Loss of All Vital DC Power based on (site-specific) bus voltage indications for greater than 15 minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all DC power compromises the ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the Reactor Coolant System. Fifteen minutes is selected as a threshold to exclude.transient and momentary power losses.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-6

1.5.29 2-7 (page 1 of 2)

APP MODE: MODES 1 - 4 — ***CLASS:*** GE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG1 Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power.
1. Prolonged loss of all offsite and onsite AC power as indicated by:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency diesel generators to supply power to emergency busses.
AND
c. At least one of the following conditions exist:
Restoration of at least one emergency bus within (site-specific) hours is *NOT* likely
OR
(Site-Specific) Indication of continuing degradation of core cooling based on Fission Product Barrier monitoring.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4
AND
Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:
Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. Prolonged loss of all AC power will lead to loss of fuel clad, RCS, and containment. The 4.5 hour time duration to restore AC power is based on the site blackout coping analysis performed in conformance with 10 CFR 50.63 and Regulatory Guide 1.155, Station Blackout. Appropriate allowance for offsite emergency response exists. Although this EAL may be redundant to Fission Product Barrier EAL*(s)*, its inclusion is necessary to better assure timely recognition and emergency response.

2-7

1.5.30 2-7 (page 2 of 2)

TECHNICAL BASIS (continued...):

The specification of this EAL assures that in the unlikely event of a prolonged loss of power to both essential buses, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one emergency bus is based on a realistic appraisal of the situation, since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Operations Director/Emergency Coordinator a reasonable idea of how quickly *(s)*he may need to declare a General Emergency based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is IMMINENT?

2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented?

Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Operations Director/Emergency Coordinator judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

Combustion Engineering, Inc., Evaluation of a Prolonged Station Blackout with Plant Recovery, Prepared for Arizona Public Service Company, MAR 1989
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.31 3-1 (page 1 of 2)

APP MODE: **MODES 1 - 6**

CLASS: **NUE**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-1

1.5.32 3-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-143 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(111000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 6.12\text{E-04 uCi / cc}$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:
Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.
Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.33 3-2 (page 1 of 2)

APP MODE: **MODES 1 - 6**

CLASS: **NUE**

CATEGORY: **[A] Abnormal Rad Levels / Radiological Effluent**

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.

1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure): (site-specific list)

NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.72E-03 µCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-2

1.5.34 3-2 (page 2 of 2).

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-145 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{mrem}{yr}}{\left(1750\ \frac{mrem/yr}{uCi/m^3}\right)\left(8.91E\text{-}06\ \frac{sec}{m^3}\right)\left(43500\ cfm\right)\left(471.9\ \frac{cc/sec}{cfm}\right)} = 1.56E\text{-}03\ uCi/cc$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
43500 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.35 3-3 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation.

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

3-3

1.5.36 3-3 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.37 3-4

APP MODE: MODES 1 - 6 *CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 0.1 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into a Notification of Unusual Event *(NUE).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-4

1.5.38 3-5

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
4. Valid Direct Area Radiation Monitor readings increases by a factor of 1000 over normal * levels.
* Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit

(normal levels comprise the highest reading in the past 24 hours excluding the current peak value)

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses unplanned increases in in-plant radiation levels that represent a degradation in the control of radioactive material, and represent a potential degradation in the level of safety of the plant. Possible events which could lead to loss of control of radioactive material of this magnitude include, but are not limited to:

w Spent resin transfer with a resin spill or resin hose break
w Waste Gas Decay Tank leak or rupture

If the increases impair safe plant operations, then this EAL escalates to an ALERT.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-5

1.5.39 3-6

APP MODE: MODES 1 - 6 | *CLASS:* NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
1. (Site-Specific) Indication of uncontrolled water level decrease in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water.
2. Uncontrolled water level decrease in the spent fuel pool and fuel transfer canal with all irradiated fuel assemblies remaining covered by water.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

These events tend to have long lead times relative to potential for radiological release outside the Site Boundary. Thus, impact to public health and safety is very low.

In light of reactor cavity seal failure incidents at two different PWRs and loss of water in the spent fuel pool/fuel transfer canal at a BWR, all occurring since 1984, explicit coverage of these types of events is appropriate, given their potential for increased doses to plant staff. Classification as an NUE is warranted as a precursor to a more serious event.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-6

1.5.40 3-7

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.
2. (Site-Specific) coolant sample activity value indicating fuel clad degradation greater than Technical Specification allowable limits.

PVNGS EMERGENCY ACTION LEVEL (EAL):

- *RCS specific activity > Technical Specification allowable limits*

LOCATION: Table 3: RADIOLOGICAL / Row 7

TECHNICAL BASIS:

This EAL is considered to reflect a potential degradation in the level of safety of the plant and a potential precursor to more serious problems. The Technical Specification limit is set to ensure that following a steam generator tube rupture accident in conjunction with an assumed steady state steam generator leak rate of 1 gpm and a concurrent loss of offsite electrical power, the 2-hour dose rate to the public will not exceed ODCM limits for exposure to the public. The action required is a plant shutdown with $T_C < 500°F$ within 6 hours for activity exceeding 100/E-Bar. With the specific activity of the coolant exceeding 1.0 µCi/gm Dose Equivalent I^{131} for more than 48 hours during one continuous time interval, or exceeding a limit line specified in Technical Specifications Figure 3.4-1, the action required is plant shutdown with $T_C < 500°F$ within 6 hours. The permission to operate for a limited period of time with the primary coolant activity greater than 1.0 µCi/gm, but below the curve in Technical Specification Figure 3.4-1, accommodates possible Iodine spiking which may accompany changes in reactor thermal power.

NUMARC DEVIATION:

NONE. PVNGS Technical Specifications depicts values associated with RCS specific activity.

SOURCE DOCUMENT:

Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-7

1.5.41 3-8 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer
OR
Valid
dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-8

1.5.42 3-8 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Plant Vent reading, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000 \frac{\text{mrem}}{\text{yr}}}{\left(1750 \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06} \frac{\text{sec}}{\text{m}^3}\right)\left(111000 \text{ cfm}\right)\left(471.9 \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.22\text{E-02 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.43 3-9 (page 1 of 2)

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent	

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

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1.5.44 3-9 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20 and by a factor which is the ratio of the normal process flowrate to the Essential ventilation process flowrate for the Fuel Building Exhaust. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Fuel Bldg. Exhaust, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(12000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.13\text{E-01 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
12000 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per μCi/m^3 using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.45 3-10 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 20. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

3-10

1.5.46 3-10 (page 2 of 2)

NUMARC DEVIATION (continued...):

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.47 3-11

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specification's value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 1.0 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into an ALERT.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.48 3-12 (page 1 of 2).

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA3 Release of Radioactive Material or Increases in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown
1. Valid (site-specific) radiation monitor readings GREATER THAN 15 mR/hr in areas requiring continuous occupancy to maintain plant safety functions:
- (Site-specific) list
2. Valid (site-specific) radiation monitor readings GREATER THAN <site specific> values in areas requiring infrequent access to maintain plant safety functions.
- (Site-specific) list
NOTE: The Emergency Director should determine the cause of the increase in radiation levels and review other ICs for applicability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are:

(1) > 15 mR/hr:
- RU-18 Control Room
- RU-18 Secondary Alarm Station

OR

(2) > 5000 mR/hr:
- RU-18 Remote Shutdown Panels
- RU-155 Main Steam Support Structure
- RU-153c Aux Bldg, 100' East
- RU-23 Chemistry Hot Laboratory
- RU-19 Fuel Building

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses increased radiation levels that impede necessary access to operating stations, or other areas containing equipment which must be operated manually, in order to maintain safe operation or perform a safe shutdown. It is this impaired ability to operate the plant that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the increase inradiation levels is not a concern of this EAL. The Emergency Coordinator must consider the source or cause of the increased radiation levels and determine if any other EAL may be involved. For example, a dose rate of 15 mrem/hr in the Control Room may be a problem in itself. However, the increase may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, an SAE or GE may be indicated by the fission product barrier matrix EALs.

3-12

1.5.49 3-12 (page 2 of 2)

TECHNICAL BASIS (continued...):

At PVNGS, this EAL could result in a declaration of an ALERT at one unit due to a radioactivity release or radiation shine resulting from a major accident at another unit. This is appropriate if the increase impairs operations at the operating unit.

This EAL is not meant to apply to increases in the containment dome radiation monitors (*RU-148 and/or RU-149)*, as these are events which are addressed in the Fission Product Barrier Reference EALs. Nor is it intended to apply to anticipated temporary increases due to planned events *(e.g., incore detector move-ment, radwaste container movement, depleted resin transfers, etc.)*.

Areas requiring continuous occupancy include the Control Room and the Secondary Alarm Station. The Radwaste Control Room is not determined to require continuous occupancy because radwaste systems are not in use following accident situations where dose rates may escalate beyond normal levels per the SER, Chapter 22, 11.B.2. The value of 15 mrem/hr is derived from the General Design Criteria-19 *(GDC-19)* value of 5 rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, Clarification of TMI Action Plan Requirements, provides that the 15 mrem/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30-day duration implies an event potentially more significant than an ALERT.

Areas requiring infrequent access are those which house equipment that do/may require manual operation to maintain safe plant operations or perform a safe plant shutdown. The Remote Shutdown Panels Area must be manned under adverse Control Room conditions and is required for plant shutdown. The other areas listed in the EAL are those identified in the Unit 3 PASS Licensing Checklist and comprises areas needed for access by plant personnel under adverse radiological conditions to perform manual operations required by plant operating procedures. For areas requiring infrequent access, the 5000 mrem/hr value is based on radiation levels which result in exposure control measures intended to maintain doses within normal occupational exposure guidelines and limits *(i.e., 10 CFR 20)*, and in doing so, will impede necessary access.

The radiation monitors associated with this EAL read in Roentgen and mR, rather than rem and mrem. Surveys of areas requiring access are recorded in mrem. For nuclear power plant gamma rays *(excluding N-16)*, mrem and mR are approximately equal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix-R Operational Considerations, 29 JUL 93
ANPP Post-Accident Sampling System Licensing Technical Review Response Justification, 09 AUG 85
Engineering Calculation 03-NC-SS-A01, Post-Accident Doses, 28 JUN 87
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUREG-0857, Safety Evaluation Report Related to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2, and 3, NOV 81
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2a

1.5.50 3-13 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **ALERT**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA2 Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.
1. A (site-specific setpoint) alarm on one or more of the following radiation monitors: (site-specific monitors)
Refuel Floor Area Radiation Monitor
Fuel Handling Building Ventilation Monitor
Fuel Bridge Area Radiation Monitor
2. Report of visual observation of irradiated fuel uncovered.
3. Water level less than (site-specific) feet for the Reactor Refueling Cavity that will result in Irradiated Fuel Uncovering.
4. Water level less than (site-specific) feet for the Spent Fuel Pool and Fuel Transfer Canal that will result in Irradiated Fuel uncovering.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal (i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication) such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur
AND
Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage, which is not applicable to PVNGS. NUREG-0818, Emergency Action Levels for Light Water Reactors, forms the basis for these EALs.

There is time available to take corrective actions, and there is little potential for substantial fuel damage. In addition, NUREG/CR-4982, Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82, July 1987, indicates that even if corrective actions are not taken, no prompt fatalities are predicted, and that risk of injury is low. In addition, NRC Information Notice No. 90-08, KR-85 Hazards from Decayed Fuel, presents the following in its discussion:

3-13

1.5.51 3-13 (page 2 of 2)

TECHNICAL BASIS (continued...):

In the event of a serious accident involving decayed spent fuel, protective actions would be needed for personnel on site, while offsite doses *(assuming an exclusion area radius of one mile from the plant site)* would be well below the Environmental Protection Agency's Protective Action Guides. Accordingly, it is important to be able to properly survey and monitor for Kr-85 in the event of an accident with decayed spent fuel.

Licensees may wish to reevaluate whether Emergency Action Levels specified in the emergency plan and procedures governing decayed fuel-handling activities appropriately focus on concern for onsite workers and Kr-85 releases in areas where decayed spent fuel accidents could occur, for example, the spent fuel pool working floor. Furthermore, licensees may wish to determine if emergency plans and corresponding implementing procedures address the means for limiting radiological exposures of onsite personnel who are in other areas of the plant. Among other things, moving onsite personnel away from the plume and shutting off building air intakes downwind from the source may be appropriate.

The 132.5 ft. elevation *(17.5 ft. above the fuel)* is based on a level corresponding to a point below which siphoning of water in the Spent Fuel Pool would cease. Any further uncontrolled water level decrease beyond this point would indicate major problems with sealing areas, signifying a potential radiation dose consequence to plant personnel.

Thus, an ALERT Classification for this event is appropriate. Escalation, if appropriate, would occur via the Radiological Category or the Emergency Coordinator judgment.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Regulatory Guide 1.25, Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors, Rev. 0, 23 MAR 72
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Section 9.1.4.6
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Bechtel Calculation 13-NC-ZY-203, Fuel Handling Accident in the Fuel Building, Rev. 4
Combustion Engineering Study 14273-RCE-404, Implications of Cavity Seal Failure, Rev. 0
INPO SOER 85-01, Reactor Cavity Seal Failure
PVNGS Procedure 41AL-1PC01, Fuel Pool Cooling and Cleanup System Local Alarm Panel 1-J-PCN-E02 Responses, Rev. 03.03
PVNGS Procedure 41AO-1ZZ26, Irradiated Fuel Damage, Rev. 03.01
PVNGS Procedure 41AO-1ZZ53, Loss of Refueling Pool and/or Spent Fuel Pool Level, Rev. 02.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.52 3-14 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE,

3-14

1.5.53 3-14 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.54 3-15 (page 1 of 2)

APP MODE: MODES 1 - 6 — ***CLASS:*** SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):

(site-specific list)

Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE,

3-15

1.5.55 3-15 (page 2 of 2) :

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.56 3-16 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

3. Valid dose assessment capability indicates dose consequences greater than 100 mR whole body or 500 mR child thyroid.

4. Field survey results indicate site boundary dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 500 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

OR

Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

3-16

1.5.57 3-16 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.58 3-17 (page 1 of 7)

APP MODE: MODES 1 - 6 | ***CLASS:*** GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem Total Effective Dose Equivalent or 5 rem thyroid Committed Dose Equivalent. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-17

1.5.59 3-17 (page 2 of 7)

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The following calculation demonstrates that EALs of 2.2 µCi/cc on the Plant Vent monitor and 19.6 µCi/cc on the Fuel Building Vent monitor will produce, for a 1-hour exposure, EPA-400 PAG values of *(a)* 1 rem TEDE at the Site Boundary, or *(b)* 5 rem thyroid CDE, without exceeding the other EPA-400 PAG value. Under NUMARC/NESP-007, these values will be used as EALs for General Emergency. The corresponding EAL values for Site Area Emergency are 10% of the General Emergency values.

For the Fuel Building Vent monitor, a reading of 1.56E-03 µCi/cc or greater will cause an automatic reduction in flow rate of 43,500 cfm to a design value of 12,000 cfm *(provided both trains of essential ventilation are in operation)*. This concentration is one-half the EAL for Unusual Event. Therefore, a flow rate of 12,000 cfm will be used for this calculation. Bringing essential ventilation online also results in charcoal filtration of the Fuel Building Vent effluent, which consists of the ventilation exhausts from the Fuel Building as well as the Auxiliary Building below ground level. This filtration results in an Iodine reduction factor of 20, that is, a charcoal filter efficiency of 95%.

The design maximum flow rate for the Plant Vent is 111,000 cfm without the refueling purge in operation. Radiation Monitoring System *(RMS)* alarm setpoints do not reduce flow rate to the Plant Vent. Charcoal filtration is brought online through operator actions for the several flows to the Plant Vent which have a potential Iodine source term. This action provides an Iodine reduction factor of 20. RMS alarm setpoints and the EALs stated as concentrations in the Plant Vent exhaust and the Fuel Building Vent exhaust are based on noble gas concentration.

Based on the foregoing, the methodology of this calculation will be to calculate TEDE and thyroid CDE at the Site Boundary for a one-hour release with a default atmospheric dispersion coefficient *($c/Q = 8.91E\text{-}06\ sec/m^3$)*, which is the highest sector annual average c/Q value from the ODCM. The calculation for the Plant Vent release uses 2.2 µCi/cc noble gas for the accident type with the highest Iodine/noble gas *(I/NG)* ratio and 95% filter efficiency for Iodine. This process would then be repeated for releases from the Fuel Building Vent at 1.96E+01 µCi/cc.

1.5.60 3-17 (page 3 of 7)

TECHNICAL BASIS (continued...):

The Iodine/noble gas *(I/NG)* ratios at time = zero effective age are obtained from MESOREM, Jr.:

Plant Vent Releases I/NG

1. Isolated Containment *(100% LOCA / with iodine filtered)* 1.9E-02
2. Steam Generator Tube Rupture with 1% Failed Fuel 7.5E-05
3. Steam Generator Tube Rupture with 100% Failed Fuel 5.1E-04
4. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
5. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
6. Waste Gas Decay Tank Rupture 0
7. Fuel Handling Accident 2.5E-04

Fuel Building Vent Releases I/NG

1. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
2. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
3. Fuel Handling Accident 2.5E-04

For both vent pathways, the Loss of Coolant Accident *(LOCA)* with 100% Failed Fuel has the highest I/NG ratio *(maximum thyroid CDE)*. Noble gas release rate is fixed at the RMS reading specified *(Plant Vent = 2.2 μCi/cc, Fuel Building Vent = 19.6 μCi/cc)* multiplied by the process flow rate *(Plant Vent = 111,000 cfm, Fuel Building Vent = 12,000 cfm)*. The source term, in units of μCi/sec., is the same for both vent pathways, given these flow rates, concentrations, and this accident type *(i.e., 19.6/2.2 = 111,000/12,000)*.

Use of the LOCA with 100% Failed Fuel is consistent with PVNGS UFSAR Section 1.8, "Regulatory Guide 1.52 Response", in which this accident type is postulated for the design basis of the Control Building Essential Ventilation System.. The same UFSAR Section also postulates the Fuel Handling Accident for the design basis of the Fuel Building Essential Ventilation System. By inspection of the above table, it can be seen that the Fuel Handling Accident has a lower I/NG ratio than the LOCA with 100% Failed Fuel. Therefore, given that the same accident type is limiting for both vent pathways, it is not necessary to calculate doses from both vents; they would be the same.

The source term or release rate is calculated in the following table per the equation:

Ci/sec = (μCi/cc) (ft^3/min) (472 cc/sec per ft^3/min) (1E-06 Ci/μCi)
= (μCi/cc) (1.07E+05) (472) (1E-06)
= (μCi/cc) (50.5)

1.5.61 3-17 (page 4 of 7)

TECHNICAL BASIS (continued...):

The isotopic mix at time = zero effective age is obtained from MESOREM, Jr.:

Nuclide	100% LOCA mix *(%)*	Source Term	Release Rate
(µCi/cc)	(Ci/sec.)		
I-131	12.1	6.0E-03	3.0E-01
I-132	12.4	6.0E-03	3.0E-01
I-133	24.8	1.2E-02	6.1E-01
I-134	27.1	1.3E-02	6.6E-01
I-135	23.6	1.1E-02	5.6E-01
Total Iodine	100.0	4.8E-02 *	2.4E+00
Kr-83m	0.0	0	0
Kr-85m	3.3	7.5E-02	3.8E+00
Kr-85	0.1	2.2E-03	1.1E-01
Kr-87	5.6	1.3E-01	6.6E+00
Kr-88	8.2	1.8E-01	9.1E+00
Kr-89	10.3	2.2E-01	1.1E+01
Xe-131m	0.1	2.2E-03	1.1E-01
Xe-133m	0.0	0	0
Xe-133	21.6	4.8E-01	2.4E+01
Xe-135m	6.1	1.4E-01	7.1E+00
Xe-135	5.1	1.1E-01	5.6E+00
Xe-137	20.0	4.4E-01	2.2E+01
Xe-138	19.6	4.3E-01	2.2E+01
Total NG	100.0	2.2E+00	1.1E+02

* Based on the I/NG ratio of 2.2E-02 and NG concentration of 2.2 µCi/cc

$CEDE_{inhalation} = \hat{A}_{i=1\text{ to }n}\,(DCF)_i\,(c/Q)\,(\text{Release Rate})_i\,(\text{Unit Conversion})$

where:

DCF_i= Dose Conversion Factor from EPA-400, Table 5-4, for nuclide "i", in rem-cc per µCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(\text{Release Rate})_i$ is as was just calculated, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

1.5.62 3-17 (page 5 of 7)

TECHNICAL BASIS (continued...):

Nuclide	DCF_i	c/Q	Release Rate	$CEDE_i$
I-131	3.9E+04	8.91E-06	3.0E-01	1.0E-01
I-132	4.6E+02	8.91E-06	3.0E-01	1.3E-03
I-133	7.0E+03	8.91E-06	6.1E-01	3.8E-02
I-134	1.6E+02	8.91E-06	6.6E-01	9.4E-04
I-135	1.5E+03	8.91E-06	5.6E-01	7.5E-03
Noble Gases	0	8.91E-06	as given	0

$CEDE_{inhalation}$ = 1.5E-01 rem/hour

External EDE = $\hat{A}_{i=1 \text{ to } n}$ $(DCF)_i$ (c/Q) (Release Rate)$_i$ (Unit Conversion)

where:

DCF_i= Dose Conversion Factor from EPA-400, Table 5-3, for nuclide "i", in rem-cc per mCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

(Release Rate)$_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 μCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	External EDE_i
I-131	2.2E+02	8.91E-06	3.0E-01	5.9E-04
I-132	1.4E+03	8.91E-06	3.0E-01	3.7E-03
I-133	3.5E+02	8.91E-06	6.1E-01	1.9E-03
I-134	1.6E+03	8.91E-06	6.6E-01	9.4E-03
I-135	9.5E+02	8.91E-06	5.6E-01	4.7E-03
Kr-83m	0	8.91E-06	0	0
Kr-85m	9.3E+01	8.91E-06	3.8E+00	3.1E-03
Kr-85	1.3E+00	8.91E-06	1.1E-01	1.3E-06
Kr-87	5.1E+02	8.91E-06	6.6E+00	3.0E-02
Kr-88	1.3E+03	8.91E-06	9.1E+00	1.1E-01
Kr-89	1.2E+03	8.91E-06	1.1E+01	1.2E-01
Xe-131m	4.9E+00	8.91E-06	1.1E-01	4.8E-06
Xe-133m	1.7E+01	8.91E-06	0	0
Xe-133	2.0E+01	8.91E-06	2.4E+01	4.3E-03
Xe-135m	2.5E+02	8.91E-06	7.1E+00	1.6E-02
Xe-135	1.4E+02	8.91E-06	5.6E+00	7.0E-03
Xe-137	1.1E+02	8.91E-06	2.2E+01	2.2E-02
Xe-138	7.1E+02	8.91E-06	2.2E+01	1.4E-01

External EDE = 4.7E-01 rem/hour

1.5.63 3-17 (page 6 of 7)

TECHNICAL BASIS (continued...):

A "depleted c/Q" could be used for the Iodine isotopes; the resulting reduction in external EDE would be small.

In MESOREM Jr. Mode-A dose projections, CEDE is from inhalation only and external EDE is from immersion only; that is, CEDE from ingestion is calculated only in Mode-B, and external EDE from deposition is used only in PAG calculations and not EAL calculations. Particulate source term is also reserved for Mode-B projections. Therefore, for purposes of Initial Phase EALs:

$TEDE = CEDE_{inhalation} + \text{External EDE}$

= 1.5E-01 + 4.7E-01

= 6.2E-01 rem/hour

Conclusion 1:

Based on a Plant Vent concentration (noble gas) of 2.2 µCi/cc or a Fuel Building Vent concentration of 19.6 µCi/cc, the TEDE PAG is not reached for the postulated accident type.

The thyroid CDE will now be calculated for a Plant Vent concentration (noble gas) of 2.2 µCi/cc to show whether this proposed EAL value reaches or exceeds the thyroid CDE PAG.

$CDE = \hat{A}_{i=1 \text{ to } n} (DCF)_i \, (c/Q) \, (\text{Release Rate})_i \, (\text{Unit Conversion})$

where:

DCF_i= Dose Conversion Factor from EPA-400, Tables 5-2 and 5-4, for nuclide "i", in rem-cc per µCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(\text{Release Rate})_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	Thyroid CDE_i
I-131	1.3E+06	8.91E-06	3.0E-01	3.5E+00
I-132	7.7E+03	8.91E-06	3.0E-01	2.0E-02
I-133	2.2E+05	8.91E-06	6.1E-01	1.2E+00
I-134	1.3E+03	8.91E-06	6.6E-01	7.6E-03
I-135	3.8E+04	8.91E-06	5.6E-01	1.9E-01

Thyroid CDE = 4.9 rem/hour

1.5.64 3-17 (page 7 of 7)

TECHNICAL BASIS (continued...):

Conclusion 2:

Based on a Plant Vent concentration (noble gas) of 2.2 µCi/cc or a Fuel Building Vent concentration of 19.6 µCi/cc, the Thyroid CDE PAG is reached (a Plant Vent concentration of 2.3 µCi/cc would give a result slightly over 5.0 rem/hour) for the postulated accident type.

NOTE: External EDE rate, TEDE rate, and thyroid CDE rate are calculated using MESOREM, Jr. Total Body Dose rate is calculated using methodology in PVNGS Procedure 74RM-9EF41.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.65 3-18 (page 1 of 2)

APP MODE: MODES 1 - 6 — *CLASS:* GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-18

1.5.66 3-18 (page 2 of 2)

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.67 3-19 (page 1 of 2)

APP MODE: MODES 1 - 6 — *CLASS:* GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
3. Valid dose assessment capability indicates dose consequences greater than 1000 mR whole body or 5000 mR child thyroid.
4. Field survey results indicate site boundary dose rates exceeding 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 5000 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation
OR
Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*.

3-19

1.5.68 3-19 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.69 4-1

APP MODE: MODES 1 - 4	CLASS: NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU5 RCS Leakage.
1. The following conditions exist:
a. Unidentified or pressure boundary leakage greater than 10 gpm.
OR
b. Identified leakage greater than 25 gpm.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unidentified or pressure boundary leakage > 10 gpm in Modes 1-4

Identified leakage > 25 gpm in Modes 1-4

LOCATION: Table 4: LEAKAGE / Row 1, Row 2

TECHNICAL BASIS:

This EAL is included as an NUE because it may be a precursor to more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified or pressure boundary leakage is selected as it is observable with normal Control Room indications. Lesser values must generally be determined through time-consuming surveillance tests *(e.g., mass balances)*. The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. Either value exceeded requires immediate classification *(i.e., Tech Spec LCO allowable Action Statement time limits are not applicable)*.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

4-1

1.5.70 5-1 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU3 Unplanned Loss of Most or All Safety System Annunciation or Indication in The Control Room for Greater Than 15 Minutes
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. Compensatory non-alarming indications are available.
AND
c. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
d. Annunciator or Indicator loss does not result from planned action.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This and other related EALs are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.)*.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities. "Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-1

1.5.71 5-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

This EAL applies to Operating Modes 1-4 only, due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.72 5-2

APP MODE: MODES 1 - 4 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU2 Inability to Reach Required Shutdown Within Technical Specification Limits.
1. Plant is not brought to required operating mode within (site-specific) Technical Specifications LCO Action Statement Time.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Limiting Conditions of Operation *(LCOs)* require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by PVNGS Technical Specifications requires a one-hour report under 10 CFR 50.72*(b)*, Non-emergency events. The plant is within its safety envelope when being shut down within the allowable LCO Action Statement time limits in the Technical Specifications. An immediate Notification of Unusual Event is required when the plant is not brought to the required operating mode within the allowable LCO Action Statement time limits in the Technical Specifications. Declaration of an NUE is based on the time at which the LCO-specified Action Statement time period elapses under the PVNGS Technical Specifications and is not related to how long a condition may have existed. Other required Technical Specification shutdowns that involve precursors to more serious events are addressed by other specific EALs.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-2

1.5.73 5-3

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU6 Unplanned Loss of All Onsite or Offsite Communications Capabilities.
1. Either of the following conditions exist:
a. Loss of all (site-specific list) onsite communications capability affecting the ability to perform routine operations.
OR
b. Loss of all (site-specific list) offsite communications capability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Row 3: *Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio*

Row 4: *Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system*

LOCATION: Table 5: MALFUNCTIONS / Row 3, Row 4

TECHNICAL BASIS:

The purpose of this EAL is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate problems with offsite authorities. The loss of offsite communications ability is significantly more compre-hensive than the condition addressed by 10 CFR 50.72.

The offsite communications loss encompasses the loss of all means of communications with offsite authorities. This EAL is intended to be used only when extraordinary means are being utilized to make communications possible *(relaying of information from radio transmissions, individuals being sent to offsite locations, or any other method entailing communications with offsite authorities made possible from a location other than the Control Room / STSC).*

The onsite communications loss encompasses the loss of all means of routine communications.

NUMARC DEVIATION:

NONE. NUMARC/NESP-007 is not specific as to locations from which communications capabilities with offsite agencies are not possible. Since communications with offsite agencies are customarily originated from within the Control Room / STSC, PVNGS does not deviate from normal practices in this area.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-3

1.5.74 5-4 (page 1 of 2)

APP MODE: MODES 1 - 2

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful.
1. (Site-specific) indication(s) exist that indicate that reactor protection system setpoint was exceeded and automatic scram did not occur, and a successful manual scram occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2

(manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS bus from the Control Room)

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient and thus, the plant safety has been compromised and design limits of the fuel may have been exceeded. An ALERT is indicated because conditions exist that lead to potential loss of fuel clad or RCS. Under these conditions, the ALERT is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Reactor Protection System setpoint being exceeded *(rather than limiting safety system setpoint being exceeded)* is specified here because failure of the automatic protection system is the issue. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons)*. Failure of a manual trip would escalate the event to an SAE.

An ALERT classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

5-4

1.5.75 5-4 (page 2 of 2)

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.76 5-5 (page 1 of 2)

APP MODE: MODES 5 - 6

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA3 Inability to Maintain Plant in Cold Shutdown.
1. The following conditions exist:
a. Loss of (site-specific) Technical Specification required functions to maintain cold shutdown.
AND
b. Temperature increase that either:
w Exceeds Technical Specification cold shutdown temperature limit
OR
w Results in uncontrolled temperature rise approaching cold shutdown technical specification limit.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

This EAL addresses complete loss of functions required for core cooling during Refueling and Cold Shutdown Modes.

This condition is based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal. A number of phenomena such as pressurization, vortexing, steam generator U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system *(SDC)* design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncovery can occur. NRC analyses show that sequences can cause core uncovery in 15 to 20 minutes and severe core damage within an hour after decay heat removal is lost. Under these conditions, RCS integrity is lost and fuel clad integrity is lost or potentially lost, which is consistent with an SAE classification. Indicators used as measurement for this EAL are those methods used by the plant in response to Generic Letter 88-17, which include Core Exit Thermocouples *(CETs)* and RCS water level monitoring. In addition, Radiation Monitoring System *(RMS)* readings may also be appropriate as an indicator of this condition.

5-5

1.5.77 5-5 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Uncontrolled" means that the system temperature increase is not the result of planned actions by the plant staff.

The EAL guidance related to the uncontrolled temperature rise is necessary to preserve the anticipatory philosophy of NUREG-0654 for events starting from temperatures much lower than the Cold Shutdown temperature limit.

NUMARC DEVIATION:

It is understood that if the plant is in conformance with Technical Specifications during operations within Cold Shutdown conditions, any functions required for OPERABILITY during this mode will be available to maintain Cold Shutdown. Hence, "Technical Specification required functions", as delineated in the NUMARC Example EAL, is redundant to that required for the specific mode and will be available for maintaining conditions required for that mode.

The Cold Shutdown temperature limit has been applied to the PVNGS EAL as a temperature of 210°F, which is the PVNGS Technical Specification upper temperature bounds of the modes applicable to this EAL.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.78 5-6 (page 1 of 2)

APP MODE: MODES 1 - 4 — *CLASS:* ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA4 Unplanned Loss of Most or All Safety System Annunciation or Indication in Control Room With Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable.
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
c. Annunciator or Indicator loss does not result from planned action.
AND
d. Either of the following:
1. A significant plant transient is in progress.
OR
2. Compensatory non-alarming indications are unavailable.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL is intended to provide recognition of the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a transient. Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.)*.

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities.

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

5-6

1.5.79 5-6 (page 2 of 2)

TECHNICAL BASIS (continued...):

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment. If both a major portion of the annunciation system and all computer monitoring are not available to the extent that the additional operating personnel are required to monitor indications, the ALERT is required.

Due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes, no EAL is indicated for these modes of operation.

This ALERT will be escalated to an SAE if the operating crew cannot monitor the transient in progress.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.80 5-7 (page 1 of 2)

APP MODE: MODES 1 - 2 *CLASS:* SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful.
1. (Site-specific) indications exist that automatic and manual scram were not successful.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. An SAE is indicated because conditions exist that lead to imminent loss or potential loss of both fuel clad and RCS. Under these conditions, the SAE is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Although this EAL may be viewed as redundant to the Fission Product Barrier Reference EAL, its inclusion is necessary to better assure timely recognition and emergency response. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons)*.

A Site Area Emergency classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

5-7

1.5.81 5-7 (page 2 of 2)

NUMARC DEVIATION (continued...):

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.82 5-8

APP MODE: MODES 5 - 6	CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS5 Loss of Water Level in the Reactor Vessel That Has or Will Uncover Fuel in the Reactor Vessel.
1. Loss of Reactor Vessel Water Level as indicated by:
a. Loss of all decay heat removal cooling as determined by (site-specific) procedure.
AND
b. (Site-specific) indicators that the core is or will be uncovered.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 4xAO-xZZ22; Safety Analysis Operational Data)

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Under the conditions specified by this EAL, severe core damage can occur and Reactor Coolant System integrity may not be assured. This EAL covers sequences such as prolonged boiling following loss of decay heat removal. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

Site-specific indicators are not detailed in the EAL due to procedural direction delineating specific indications to be used in the assessment of reactor vessel water level. The Abnormal Operating Procedure also references the PVNGS Safety Analysis Operational Data Document to determine the associated core conditions based on time shutdown, vessel level, makeup flow rate, and core decay heat load.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ22, Loss of Shutdown Cooling, Rev. 06.14
PVNGS Safety Analysis Operational Data, Rev. 0
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-8

1.5.83 5-9

APP MODE: MODES 1 - 4

CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS4 Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown.
1. Complete loss of any (site-specific) function required for hot shutdown.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function (i.e., heat removal, reactivity control) or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL addresses complete loss of functions, including the ultimate heat sink and reactivity control, which are required to achieve or maintain Hot Shutdown. The Heat Removal Safety Function encompasses systems associated with removing heat from the core following plant shutdown, such as steam generators, which are required to be fed and steamed to be Operable, and the Shutdown Cooling System, which is required when steam generators are no longer needed or are unavailable for heat removal. The Reactivity Control Safety Function relies on shutdown margin requirements to ensure an unanticipated criticality situation does not occur, jeopardizing the RCS pressure boundary and possibly leading to core damage. Under these conditions, there is an actual major failure of a system intended for protection of the public. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-9

1.5.84 5-10 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS6 Inability to Monitor a Significant Transient in Progress.
1. The following conditions exist:
a. Loss of (site-specific) annunciators associated with safety systems.
AND
b. Compensatory non-alarming indications are unavailable.
AND
c. Indications needed to monitor (site-specific) safety functions are unavailable.
AND
d. Transient in progress.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available

LOCATION: Table 5: MALFUNCTIONS / Row 4

TECHNICAL BASIS:

This EAL and its associated EALs are intended to recognize the inability of the Control Room staff to monitor the plant response to a transient. An SAE is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor/Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-10

1.5.85 5-10 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

Indications needed to monitor safety functions necessary for protection of the public includes Control Room indications, computer generated indications *(i.e., QSPDS)*, and dedicated annunciation capability. The specific indications are those used to determine such functions as the ability to shut down the reactor, maintain the core cooled and in a coolable geometry, to remove heat from the core, to maintain the Reactor Coolant System intact, and to maintain containment integrity.

"Planned" actions are excluded from this EAL since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not an ameliorating factor.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system would audibly annunciate and the text associated with a particular parameter would change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it would also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.86 5-11 (page 1 of 2)

APP MODE: MODES 1 - 2

CLASS: GE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG2 Failure of the Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is Indication of an Extreme Challenge to the Ability to Cool the Core.
1. (Site-specific) indications exist that automatic and manual scram were not successful.
AND
2. Either of the following:
a. (Site-specific) indications exist that the core cooling is extremely challenged.
OR
b. (Site-specific) indications exist that heat removal is extremely challenged.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to complete an automatic reactor shutdown (i.e., subcritical) and manual shutdown was not successful when in Modes 1-2
AND
CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons).*

Under the conditions of this and associated EALs, the efforts to bring the reactor subcritical have been unsuccessful and, as a result, the reactor is producing more heat than the maximum decay heat load for which the safety systems were designed. Although there are capabilities away from the reactor control console, such as emergency boration, the continuing temperature rise indicates that these capabilities are not effective. This situation could be a precursor for a core melt sequence.

The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200°F or that the reactor vessel water level is below the top of the active fuel.

5-11

1.5.87 5-11 (page 2 of 2)

TECHNICAL BASIS (continued...):

Another consideration is the inability to initially remove heat during the early stages of this sequence. If Essential Auxiliary Feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist.

In the event either of these challenges exist at a time that the reactor has not been brought below the power associated with the safety system design *(typically 3%)*, a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the GE declaration is intended to be anticipatory of the Fission Product Barrier Reference declaration to permit maximum offsite intervention time.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

1.5.88 6-1

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU2 Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection.
1. Fire in buildings or areas contiguous to any of the following (site-specific) areas not extinguished within 15 minutes of control room notification or verification of a control room alarm.
w (Site-specific) list

PVNGS EMERGENCY ACTION LEVEL (EAL):

Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

The purpose of this EAL is to address the magnitude and extent of fires that may be potentially significant precursors to damage to safety systems. This excludes such items as fires within administration buildings, waste-basket fires, and other small fires of no safety consequence. This EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or areas that are not contiguous or immediately adjacent to plant vital areas. Verification of the alarm, in this context, means those actions taken in the Control Room to determine that the Control Room alarm is not spurious.

NUMARC DEVIATION:

Site-specific areas are not delineated in the PVNGS EAL due to the ramifications involved when a fire affects the Protected Area. Because PVNGS is a three-unit site, and because a listing of specific areas which could be affected by a fire within buildings and/or areas immediately contiguous to this site-specific listing would defeat the purpose of possessing the ability to determine if the fire is affecting the Protected Area, the Shift Supervisor / Emergency Coordinator will be better served when a determination has to be made at the time whether the Protected Area is affected or not. The term "affecting major structures or areas within the Protected Area" is used here in the same context as is used elsewhere within the "HAZARDS" Event Category.

The 15 minute time period for a fire to be extinguished prior to declaration, in itself, allows for the exclusion of extremely small fires *(i.e., waste-basket fires, etc.)* which are easily extinguished, and sets a measurable standard which recognizes that any increase in the length of time a fire burns increases the risk of damage to equipment or injury to plant personnel.

A site-specific listing of possible Control Room annunciators that may be relevant to the diverse set of related fires appropriate to this EAL is not included within the text of the EAL due to procedural direction within the Control Room involving priorities established for operator response within those procedures. The annunciator responses *(several hundred, each specific to a designated area or component)* established for the Fire Alarm Terminal CRT are used in conjunction with the Pre-Fire Strategies Manual by Control Room and Fire Protection personnel in assessing and responding to fires within the facility.

SOURCE DOCUMENT:
PVNGS Pre-Fire Strategies Manual, Rev. 6
Fire Point/Zone Alarm Book
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-1

1.5.89 6-2

APP MODE: MODES 1 - 6 | *CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
5. Report by plant personnel of an unanticipated explosion within protected area boundary resulting in visible damage to permanent structure or equipment.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Explosion affecting the Protected Area resulting in visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

The Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04.

Only those explosions of sufficient force to damage permanent structures or equipment within the Protected Area are considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The SS / EC also needs to consider any security aspects of the explosion, if applicable.

NUMARC DEVIATION:

NONE. The grammatical structure of the EAL lends itself to visible damage as reported by site personnel.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-2

1.5.90 6-3

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
4. Vehicle crash into plant structures or systems within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile that may potentially damage plant structures containing functions and systems required for safe shutdown of the plant. The event is escalated to an ALERT if the crash is confirmed to affect a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems within the Protected Area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-3

1.5.91 6-4

APP MODE: MODES 1 - 6	CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU3 Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant.
1. Report or detection of toxic or flammable gases that could enter within the site area boundary in amounts that can affect normal operation of the plant.
2. Report by Local, County, or State Officials for potential evacuation of site personnel based on offsite event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on releases in concentrations within the Site Boundary that will affect the health of plant personnel or affecting the safe operation of the plant with the plant being within the evacuation area of an offsite event *(i.e., tanker truck accident releasing toxic gases, etc.)*. In the latter case, the evacuation area will be as determined from the DOT Evacuation Tables for Selected Hazardous Materials, located in the DOT Emergency Response Guide for Hazardous Materials.

NUMARC DEVIATION:

The EAL does not address toxic or flammable gas origins or causes for evacuations of personnel located within the Site Area Boundary due to an offsite event. Gases that could enter the Site Boundary encompass causes for evacuation. The EAL addresses the impact to personnel and the safe operation of the plant, regardless of the origin of these evacuation directives.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-4

1.5.92 6-5

APP MODE: MODES 1 - 6	*CLASS:* NUE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
6. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals

LOCATION: Table 6: HAZARDS / Row 5

TECHNICAL BASIS:

This EAL is intended to address main turbine rotating component failure of sufficient magnitude to cause observable damage to the turbine casing or to the seals of the turbine generator. Of major concern is the potential for leakage of combustible fluids *(lubricating oils)* and gases *(hydrogen cooling)* to the plant environs. Actual fires and flammable gas build-up are appropriately classified via HU2 and HU3. This EAL is consistent with the definition of an NUE while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment.

NUMARC DEVIATION:

"Turbine oil seals" is indicated to clarify the intent of the EAL. Damage to the turbine casing is determined by visual and/or indicated observations from the Control Room *(i.e., visual CRT display of turbine bearing vibrations and condenser vacuum indicators)*. Sufficient instrumentation exists to adequately determine turbine failures involving seal failures which conform to the intent of this EAL. A reliance is implied, though, for visual damage indications by plant personnel.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-5

1.5.93 6-6

APP MODE: MODES 1 - 6	CLASS: NUE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
1. (Site-specific) method indicates felt earthquake.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid "Strong Motion Accelerometer System Trigger" indicated on Seismic Warning Panel per 79IS-9SM01

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL references PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, which is performed by the Shift Technical Advisor upon receipt of a "SEISMIC OCCURRENCE" Control Room annunciation. Under the intent of this EAL, damage may be caused to some portions of the site, but should not affect ability of safety functions to operate. The method of detection is based on instrumentation and validated by the aforementioned procedure. As defined in the EPRI-sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, a "felt earthquake" is:

An earthquake of sufficient intensity such that: *(a)* the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and *(b)* for plants with operable seismic instrumentation, the seismic switches of the plant are activated. For most plants with seismic instrumentation, the seismic switches are set at an acceleration of about 0.01g.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-6

1.5.94 6-7

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
2. Report by plant personnel of tornado striking within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Tornado affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the assumption that a tornado striking *(touching down)* within the Protected Area Boundary may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. If such damage is confirmed visually or by other in-plant indications, the event will be escalated to an ALERT.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-7

1.5.95 6-8

APP MODE: MODES 1 - 6	***CLASS:*** NUE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
7. (Site-Specific) Occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-8

1.5.96 6-9

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA2 Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown.
1. The following conditions exist:
a. Fire or explosion in any of the following (site-specific) areas:
w (Site-specific) list
AND
b. Affected system parameter indications show degraded performance or plant personnel report visible damage to permanent structures or equipment within the specified area.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

Equipment and plant areas required for the current operating Mode are delineated in PVNGS Technical Specifications. As such, a determination can be made if the fire or explosion is potentially affecting one or more redundant trains of safety systems which are required to be OPERABLE for the current operating Mode. With regard to explosions, only those explosions of sufficient force to damage permanent structures or equipment required for safe operation within the identified plant area should be considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. The inclusion of a "report of visible damage" should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The declaration of an ALERT and the activation of the TSC will provide the Emergency Operations Director *(EOD)* with the resources needed to perform these damage assessments. The EOD also needs to consider any security aspects of the explosion*(s)*, if applicable.

NUMARC DEVIATION:

Specifying "plant areas and equipment required for the current operating Mode" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of functions and systems applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details functions and systems required to be OPERABLE for applicable Modes.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-9

1.5.97 6-10

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA5 Control Room Evacuation Has Been Initiated.
1. Entry into (site-specific) procedure for control room evacuation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Entry into 4xAO-xZZ27 or 4xAO-xZZ44 for Control Room evacuation

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

With the Control Room evacuated, additional support with monitoring and direction through the Technical Support Center and/or Emergency Operations Facility is necessary. Inability to establish plant control from outside the Control Room will escalate this event to an SAE.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-10

1.5.98 6-11

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
5. Vehicle crash affecting plant vital areas.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact affecting plant vital areas

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile affecting a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems affecting a plant vital area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.99 6-12

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
3. Report of any visible structural damage on any of the following plant structures:
w Reactor Building
w Intake Building
w Ultimate Heat Sink
w Refueling Water Storage Tank
w Diesel Generator Building
w Turbine Building
w Condensate Storage Tank
w Control Room
w Other (Site-Specific) Structures

PVNGS EMERGENCY ACTION LEVEL (EAL):

Visible structural damage to any building containing safe shutdown equipment

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL addresses structures containing systems and functions required for safe shutdown of the plant. The structural damage implied has origins related to any destructive phenomena not explicitly addressed in any other EAL in this category.

NUMARC DEVIATION:

Specifying "any building containing safe shutdown equipment" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of plant structures and buildings applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details plant structures and buildings required to be OPERABLE for applicable Modes as delineated within Limiting Conditions for Operation *(LCOs)* requiring Operability for all supporting equipment and functions needed for Operability of the applicable system or function.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-12

1.5.100 6-13

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA3 Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown.
1. Report or detection of toxic gases within a Facility Structure in concentrations that will be life threatening to plant personnel.
2. Report or detection of flammable gases within a Facility Structure in concentrations that will affect the safe operation of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on gases that have entered a plant structure affecting the safe operation of the plant. The EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or other areas that are not contiguous or immediately adjacent to plant vital areas. It is appropriate that increased monitoring be done to ascertain whether consequential damage has occurred. The PVNGS site Fire Department operates under OSHA guidelines in determining if facility structures meet habitability requirements. They are staffed continuously and are trained and required to respond to hazardous materials, hazardous atmospheres, etc.

NUMARC DEVIATION:

This EAL has been phrased to allow for the inclusion of safe plant operations encompassing both plant personnel and safety systems required for the current operating Mode. Equipment required for the establishment and maintenance of Cold Shutdown is required to be OPERABLE in Modes specifying the applicability.

SOURCE DOCUMENT:

PVNGS Procedure 14AC-0FP02, Emergency Notification and Response, Rev. 02.02
PVNGS Procedure 14DP-0FP27, PVNGS Fire Department Hazardous Incident Response, Rev. 00.00
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-13

1.5.101 6-14

APP MODE: MODES 1 - 6 — *CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
6. Turbine failure generated missiles result in any visible structural damage to or penetration of any of the following plant areas: (site-specific) list.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL is intended to address the threat to safety related equipment imposed by missiles generated by main turbine rotating component failures. Since PVNGS was designed to minimize impacts to safety related equipment caused by main turbine rotating component failures *(i.e., no safety related equipment is located on a tangent to turbine rotational direction)*, there are no areas within which damage to structures containing this equipment can be affected by ejected turbine components. Catastrophic failure of the main turbine rotating components, though, would likely cause damage to the main condenser, condensate and/or circulating water system*(s)* piping, or personnel in the vicinity. However, this EAL is consistent with the definition of an ALERT in that if missiles have damaged or penetrated areas containing safety related equipment, the potential exists for substantial degradation of the level of safety of the plant.

NUMARC DEVIATION:

No listing of structures containing safety related equipment specific to PVNGS is included in the EAL due to the inherent characteristics of the manufacturers' design of the plant *(i.e., Bechtel, Combustion Engineering).* No safety related equipment is located on a tangent to the rotational direction of the main turbine spindles.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-14

1.5.102 6-15

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
1. (Site-Specific) method indicates Seismic Event greater than Operating Basis Earthquake (OBE).

PVNGS EMERGENCY ACTION LEVEL (EAL):

Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Seismic events of this magnitude can cause damage to safety functions. The determination of the magnitude of the seismic event is based on preliminary analysis by the Shift Technical Advisor that the OBE annunciation is valid. The event classification can then be declared in a prompt manner. Performance of 79IS-9SM01, Analysis of Seismic Event, by the STA upon receipt of "SEISMIC OCCURRENCE" Control Room annunciation is then performed as appropriate to the indications.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
PVNGS Updated Final Safety Analysis Report (UFSAR), Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-15

1.5.103 6-16

APP MODE: **MODES 1 - 6** | ***CLASS:*** **ALERT**

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
2. Tornado or high winds striking plant vital areas: Tornado or high winds greater than (site-specific) mph strike within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Wind loads of this magnitude can cause damage to safety functions. Sustained winds of > 105 mph or tornados with cyclonic velocities exceeding 260 mph *(Category F5)* with simultaneous tangential movement of 40 mph *(i.e., 260 + 40 = 300 mph)* are design levels per the PVNGS FSAR. Sustained winds are wind speeds averaged over one minute that generally remain continuous for at least 15 minutes *(NOAA-NWS definition)* and exclude localized gusts exceeding these wind velocity limits.

NUMARC DEVIATION:

NONE. "Sustained" winds are based on National Weather Service *(NWS)* forecasts and/or warnings issued locally. Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, meteorological tower data should not be used for weather assessments regarding wind velocities of this force for emergency classification purposes. Estimated sustained winds furnished by the National Weather Service should provide the basis for emergency classification purposes. EAL HA1-3 will provide evidence of damage to safe shutdown structures when winds of this nature are exceeded.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

6-16

1.5.104 6-17

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
7. (Site-Specific) occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding potentially affecting safety systems required for the current operating Mode

LOCATION: Table 6: HAZARDS / Row 9

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation. The effect that flooding of this extent could have on "safety systems required for the current operating Mode" is consistent with other hazards and naturally occurring events of this type.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-17

1.5.105 6-18

APP MODE: MODES 1 - 6	CLASS: SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS2 Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established.
1. The following conditions exist:
a. Control room evacuation has been initiated.
AND
b. Control of the plant cannot be established per (site-specific) procedure within (site-specific) minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

Expeditious transfer of safety systems has not occurred but fission product barrier damage may not yet be indicated. PVNGS Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix R Operational Considerations, establishes 23 minutes for initiating Auxiliary Feedwater to the steam generator*(s)* as the most limiting initial action which must be taken under these conditions. However, the 15 minute time period established generically for transfer of safety system control to the Remote Shutdown Panel*(s)* is based on an assessment as to how quickly control must be re-established without core uncovering and/or core damage possibly taking place. *(Based on the generic basis, this time period must never exceed 15 minutes.)* In Cold Shutdown and Refueling Modes, operator concern is directed toward maintaining core cooling such as is discussed in Generic Letter 88-17, Loss of Decay Heat Removal. In power operation, Hot Standby, and Hot Shutdown Modes, operator concern is primarily directed toward maintaining critical safety functions and thereby assuring fission product barrier integrity.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50 Appendix R Operational Considerations, 29 JUL 93
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside the Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-18

1.5.106 7-1

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU4 Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant.
1. Bomb device discovered within plant protected Area and outside the plant Vital Area.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

This EAL is based on the PVNGS Site Security Plan. Security events which do not represent at least a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 or, in some cases, under 10 CFR 50.72. The plant Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04. A bomb discovered in the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Color Code Condition - Red *(Security Emergency).*

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-1

1.5.107 7-2

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA4 Security Event in a Plant Protected Area.
1. Intrusion into plant protected area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within the Protected Area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

The Control Room Shift Supervisor should declare this EAL when there is direct evidence that hostile forces are or have been inside the Protected Area, but the Control Room or any vital area are not currently threatened. The Shift Supervisor should also consider this EAL in situations where the presence of hostile forces within the Protected Area is indicated by sabotage to plant equipment, but the full extent of damage to equipment or the full scope of the sabotage may not yet be known. This class of security events represents an escalated threat to plant safety above that contained in the NUE. For the purposes of this EAL, a civil disturbance which penetrates the Protected Area Boundary can be considered a hostile force and, as such, the intrusion of this hostile force into the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-2

1.5.108 7-3

APP MODE: MODES 1 - 6	***CLASS:*** SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS1 Security Event in a Plant Vital Area.
1. Intrusion into plant vital area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within any vital area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Hostile forces consist of one or more persons armed with any sort of weapon*(s)* whose intent is evident by declaration or action to cause damage to plant equipment or injury to plant personnel. The principal role in dealing with a security threat belongs to the security forces. The role of the operator is to ensure to the maximum.extent possible under the circumstances that the health and safety of the public is protected. Entry of hostile forces inside the protected area compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. Hostile forces may seek to damage plant equipment and cause a release, or injure or kill plant operating staff. Situations where hostile forces are known to have entered the Protected Area places the Control Room, Remote Shutdown Panels, or other areas defined as vital in the unit security plans at extreme and immediate risk. Entry of hostile forces inside the protected area undoubtedly constitutes a situation in which there is an actual or potential substantial degradation in the level of plant safety. This class of security events represents an escalated threat to plant safety above that contained in the ALERT in that a hostile force has progressed from within the Protected Area to a vital area.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-3

1.5.109 7-4

APP MODE: MODES 1 - 6	***CLASS:*** GE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HG1 Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown.
1. Loss of physical control of the control room due to security event.
2. Loss of physical control of the remote shutdown capability due to security event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Entry of hostile forces into the Control Room or Remote Shutdown Panel Room*(s)* compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. If the hostile forces are known to have entered the Control Room or Remote Shutdown Panel Room*(s)* or other vital plant areas, the freedom of operators to maintain the plant in a safe operating condition is lost. This EAL encompasses conditions under which a hostile force has taken physical control of the Control Room, Remote Shutdown Panel Room*(s)*, or any other vital area required to reach and maintain safe shutdown conditions. Although actual core melt or loss of containment integrity has not occurred and there is no immediate evidence of substantial releases in progress, control of the reactor plant by hostile forces undoubtedly constitutes the most serious possible threat.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-4

1.5.110 , 8-1

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
3. Assessment by the control room that an event has occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting the Protected Area

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(i.e., an earthquake is felt but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-1

1.5.111 8-2

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU5 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event.
1. Other indications exist which in the judgment of the Emergency Director indicate a potential degradation of the level of safety of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate a potential degradation of the level of safety of the plant

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the NUE emergency class.

From a broad perspective, one area that may warrant SS/EC judgment is related to likely or actual breakdown of PVNGS event mitigating actions. Examples to consider include inadequate emergency response procedures *(e.g., Emergency Plan Implementing Procedures, etc.)*, transient response either unexpected or not understood, failure or unavailability of emergency systems during an accident in excess of that assumed in accident analyses, or insufficient availability of equipment and/or support personnel.

Specific examples of actual events that may require SS/EC judgment for an NUE declaration are listed below for consideration. However, this list is by no means all inclusive and is not intended to limit the discretion of the SS/EC judgment in applying further examples.

w Aircraft crash on site
w Train derailment on site
w Near-site explosion which may adversely affect normal site activities
w Near-site release of toxic or flammable gas which may adversely affect normal site activities
w Uncontrolled RCS cooldown due to secondary side depressurization

It is also intended that the SS/EC judgment not be limited by any list of events as defined here or as augmented by the site. This list is provided solely as examples for consideration and it is recognized that actual events may not always follow a pre-conceived description.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-2

1.5.112 8-3

APP MODE: **MODES 1 - 6**	***CLASS:*** **ALERT**

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
4. (Site-Specific) indications in the control room.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting plant vital areas

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(e.g., an earthquake is believed to exceed OBE levels but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-3

1.5.113 8-4

APP MODE: MODES 1 - 6	*CLASS:* ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA6 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert.
1. Other indications exist which in the judgment of the Emergency Director indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the ALERT emergency class. If the SS/EC believes that increased monitoring of plant functions is warranted and deems that activation and staffing of Emergency Response Facilities is required for this monitoring, then the ALERT declaration is warranted.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-4

1.5.114 8-5

APP MODE: MODES 1 - 6	*CLASS:* SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS3 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate actual or likely major failures of plant functions needed for protection of the public.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate actual or likely major failure of plant functions needed for protection of the public

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the emergency class description for SAE.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-5

.1.5.115 8-6

APP MODE: MODES 1 - 6	***CLASS:*** GE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HG2 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate: *(1)* actual or imminent substantial core degradation with potential for loss of containment, or *(2)* potential for uncontrolled radionuclide releases. These releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the site boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate:

(1) actual or imminent substantial core degradation with potential for loss of CTMT, or
(2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated.conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the GE class.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-6

Appendix R - Dose Projection Technical Bases

1.0 DOSE PROJECTION TECHNICAL BASES

1.1 Introduction

1.1.1 This document provides various supporting information related to dose assessment activities above and beyond that available in the instructions for Dose Projection, Protective Actions, and the Emergency Exposure/KI. It is intended to be used primarily by the EOF Staff.

1.1.2 This section contains the following subsections:

1.1.2.1 Aids to project dose in an un-monitored release situation. Typical situations where this information may be useful would be a fire (outdoors or in a building) where the release is directly to atmosphere (un-filtered). Other situations might involve a release from the Fuel Building or Auxiliary Building due to an open door or breach; or an outdoor large storage tank being vented directly to atmosphere.

1.1.2.2 The modeled accidents in Mesorem Jr. utilize "standard" and default data in order to expedite the release projection. This section provides information to fine tune a projection by adjustment of various entries. Also provided is detailed accident specific information which may be requested by ARRA or the NRC.

1.1.2.3 Mesorem Jr. can be used to provide additional information beyond the initial dose projections; such as using a completed grab sample analysis to verify a projection, or assigning an important offsite location an individual receptor point. This section covers some selected options in those areas.

1.1.2.4 Source Term Monitoring general information and job aids are provided.

1.1.2.5 Control of dose must be done on a TEDE basis rather than relying on Whole Body dose. Until completed airborne sample data is available, the CEDE component of the TEDE will be unknown. This section provides information on how to use the External EDE and TEDE projected doses from the Mesorem Jr. printout to determine the expected ratio.

1.1.2.6 A methodology to adjust a Mesorem Jr. projection to actual field readings is provided.

1.1.2.7 General RMS information is provided.

1.2 Isolated Containment supporting information

1.2.1 The accident assumption is that a LOCA is occurring inside an isolated containment; with the release being the summed leakage to atmosphere from all of the containment penetrations (even though the penetrations are for the most part in the Aux. Bldg.). This selection may be used for any accident causing airborne activity in an Isolated Containment. The release calculation is based on a correlation of airborne activity to the higher of the RU-148/149 readings.

1.2.1.1 Mesorem requires Rem/hr values for RU-148/149; DO NOT INPUT mRem/hr.

1.2.1.2 Note that a failed fuel situation may cause elevated readings on these monitors even though there is no airborne activity in containment to be released.

1.2.1.3 As the typical leakage is small, extreme monitor levels are needed to result in a significant release.

1.2.2 RU-148/149 correlation reading

1.2.2.1 If RU-148/149 are Inoperable, (or suspect) a calculation has been performed and a chart made (Page 5 this section) such that readings from any of several RU monitors outside containment may be used to correlate to a RU-149 level. Closed Window dose rates taken at the alternate detector geometry may be substituted if available.

1.2.3 Containment Leak Rate

1.2.3.1 The default leakage is assumed to be 852 cc/sec per FSAR Section 6.2.1, Table 6.2.1-3, "Principal Containment Design Parameters"; the containment design level leak rate is 0.1% of the free volume per day at 60 PSIG with a containment free volume of 2.6E6 Cubic Feet (7.36E10 Cubic Centimeters).

1.2.3.2 Increasing Leak Rates per time

0.1	% per day	8.52 E2 cc/sec	(Default)
1.0	% per day	8.52 E3 cc/sec	
0.1	% per hour	2.04 E4 cc/sec	
10	% per day	8.52 E4 cc/sec	
1.0	% per hour	2.04 E5 cc/sec	
100	% per day	8.52 E5 cc/sec	
10	% per hour	2.04 E6 cc/sec	
100	% per hour	2.04 E7 cc/sec	

1.2.3.3 Actual Leak Rates will be difficult for the Technical Staff to determine during an event; ask for bounding estimates within the above alternates.

1.2.4 Basis of mix used for MESOREM projection

1.2.4.1 Reg Guide 1.4, "Assumptions used for evaluating the potential radiological consequences of a loss of coolant accident for pressurized water reactors" calls for the following assumptions to be made by license applicants:

- 25% of the Iodine inventory should be assumed to be available for leakage.
- 100% of the Noble Gas inventory should be assumed to be available - a reduction of the amount of material available for leakage may be taken for containment spray effects, but the amount of reduction should be evaluated on an individual case basis (there is no built-in Mesorem adjustment for this).
- FSAR 6.5.2.2 states that only 6% of the containment volume is unsprayed.

1.2.4.2 For the first 24 hours of an accident, the containment leak rate should assume Technical Specification leak rate at peak accident pressure.

1.2.5 ARRA/NRC - Both groups have procedural requirements which require more data. To be prepared to answer questions the below may be reviewed.

1.2.5.1 Is 20% or greater Core Damage projected or in progress?

- The Mesorem projection will provide an estimated Core Damage Fraction (CDF) in percent. This will not equate readily with the NRC Categories of Fuel Failure, but will provide an indication of the amount of core damage. Provide Tech Staff with the CDF given by Mesorem, and have them determine estimated damage.

1.2.5.2 Will the inventory in Containment exceed the PAGs if released at a 100% per day leak rate?

- The projection dose rate and dose values based on an 852 cc/sec leak rate are multiplied by 1000 to obtain 100% release per day values; and by 24,000 to obtain 100% release per hour values.

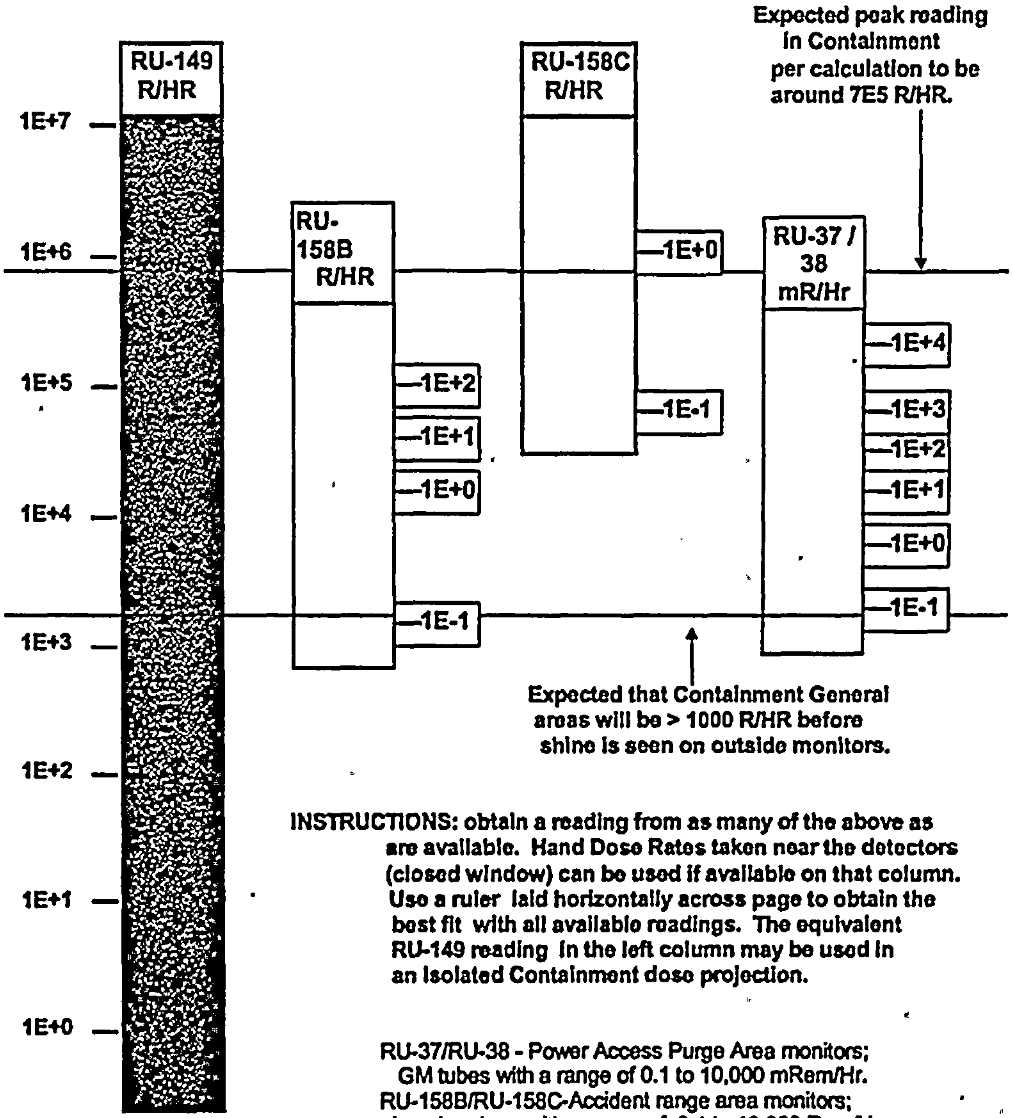
1.2.5.3 What is the expected dose at Site Boundary if the leak rate increases by a factor of 10 or 100?

- If RU-148 has the same reading when the leak rate increases by a factor of ten, the projected Site Boundary dose will also increase by a factor of 10.

1.2.6 The following table provides a visual idea of the RU-148 levels required to obtain similar Site Boundary Dose rates as leak rates vary. The calculations reflect the RU-148 readings that would meet the EAL 3-16 and 3-19 levels. These are worst case scenario calculations done with default met data, shortest distance to Site Boundary, etc.

Leak Rate from Containment	RU-148 in Rem/hr	EAL 3-16 Criteria met @Site Boundary	EAL 3-19 Criteria met @Site Boundary
100%/Day	80	100 mRem/hr TEDE	
(8.52E5 cc/sec)	500		1 Rem/hr TEDE
10%/Day	500	100 mRem/hr TEDE	
(8.52E4 cc/sec)	2800		1 Rem/hr TEDE
1%/Day	2800	100 mRem/hr TEDE	
(8.52E3 cc/sec)	13,300		5 Rem/hr Thyroid CDE
.1%/Day	13,300	500 mRem/hr Thyroid CDE	
(8.52E2 cc/sec)	36,500		5 Rem/hr Thyroid CDE

1.2.7 CONTAINMENT DOSE RATE ESTIMATION USING AREA MONITORS EXTERNAL TO CONTAINMENT



INSTRUCTIONS: obtain a reading from as many of the above as are available. Hand Dose Rates taken near the detectors (closed window) can be used if available on that column. Use a ruler laid horizontally across page to obtain the best fit with all available readings. The equivalent RU-149 reading in the left column may be used in an isolated Containment dose projection.

RU-37/RU-38 - Power Access Purge Area monitors; GM tubes with a range of 0.1 to 10,000 mRem/Hr.
RU-158B/RU-158C-Accident range area monitors; ion-chambers with a range of 0.1 to 10,000 Rem/Hr.

1.3 Steam Generator Tube Rupture supporting information

1.3.1 Steam Generator Tube Rupture

1.3.1.1 The release path may be steam released directly via the Main Steam Safety Valves (MSSVs); the Atmospheric Dump Valves (ADVs) or the Steam Bypass Control System valves (SBCS numbered 1007 and 1008).

1.3.1.2 The release path may be through the Plant Vent Stack from the condenser air removal line (and through the Condenser Air Removal filter if lined up).

1.3.1.3 The release will most likely be a combination of the above, with a very complex situation of valves opening varying percentages for varying periods. The initial projections will be very conservative, and the EOF Staff should make it a priority to break down the release into more accurate separate calculations. It is essential that the Operations/Technical Staff assist in this effort.

1.3.1.4 A possibility exists that a Steam Generator could fill completely during an accident (go solid). If a generator would fill with primary side water such that fresh primary is being dumped to the atmosphere all projected Thyroid CDE data should be multiplied by 100.

1.3.2 Early indicators

1.3.2.1 An early indication of a primary/secondary leak at power will be given by the RU-142 monitors, Channels 1 through 4. They will indicate roughly 40 cpm to 300 cpm as conditions change from normal (no leaks) to about 30 GPD. This reading is quantitative only, as where the leak physically occurs in the Steam Generator will have a significant effect on the N-16 carryover activity. Therefore the primary use of these monitors will be in the initial leak phase, prior to reactor shutdown. Increases seen on these channels will be one of the first indications that a leak is occurring, and will serve to verify any RU-4/5/139/140/141 increases seen. In a significant leak (>30 GPD) these monitors can be expected to go way upscale, perhaps even saturate; and the shine from the affected generator line will probably result in indications on all three adjacent detectors.

1.3.3 Other RMS

1.3.3.1 Applicable monitors are RU-141; RU-143/144; RU-139/140; RU-4/5.

1.3.3.2 RU-141 monitors activity from the Condenser Air Removal System (CARS); with the Alert Alarm will indicating an activity increase of 4X > normal; the High Alarm will line up the CARS filter and equates to a 1 GPM Tube Leak assuming 1% Failed Fuel. The CARS line inputs into the Plant Vent Stack, upstream of the RU-143/144 Stack monitors.

1.3.3.3 An RU-143/144 alarm may be a result of more than one input (see map on DPTB Page 11).

1.3.3.4 RU-139 A&B and RU-140 A&B are the main steam line monitors located upstream of all Safety's/Dumps/ADVs. They will over-respond initially to N-16 carryover in the steam if the reactor is still critical during a tube rupture phase. They will have a period when release activity is being carried over by the steam but is not seen as it is less than the 1.5 mRem/hr keep-alive source value.

1.3.4 Worst case defaults

1.3.4.1 Should RU-139/140 be inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release These default values are based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, and assume 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release

1.3.5 DOs and DON'Ts

1.3.5.1 Verify with OPS that the CAR Filter is lined up.

- The default value of 95% should be used for iodine removal efficiency unless the Condenser Air Removal filter is unavailable or indications of impaired efficiency exist. Indications would be alarms from the filter bank temperature and pressure sensors in the Control Room. Temperatures of > 265° F indicate impaired filtration; > 625° F indicates a fire in the carbon filter banks; high differential pressure indicates filter loading. Adjustments to the 95% values should be approved by the RPM/RAC based on the STA/TSC Staff information.

1.3.5.2 Adjusting defaults for over conservatism.

- The default value for RCS Hot Leg (210°) reflects the lowest possible vapor value and is not meant to be a reasonable value to use.
- The default steam flows will most likely never be appropriate to use for a 2 hour release scenario. The maximum steam flows possible (100% power) are in the table below - these should be adjusted per the STA and Tech Staff estimates - DO NOT BE RELUCTANT TO MAKE COMMON SENSE ADJUSTMENTS and then DOCUMENT your thought process.

Component @ 100% Power	Maximum Flow in Lbm/Hr
Output of both Steam Generators	1.72E7
Output of one Steam Generator	8.59E6
Fully Open Safety Valve	9.70E5
Fully Open Steam Bypass Control Valve	9.03E5
Fully Open ADV	1.90E6

- The Steam Generators cannot maintain maximum steam flow for anywhere near two hours after reactor trip. The ADVs/Safety's/Steam Bypass Control valves are typically only partially open for short duration periods.

1.3.5.3 Be aware that releases occur below the RU-139/140 threshold level.

- Only activity greater than the 1.5 mRem/hr threshold level of the RU-139/140 inline monitors will be seen via RMS. If it is likely that activity is being released at these lesser levels, a bounding calculation can be done by using the current Meteorological data and running a projection using 1.5 mRem/hr.

1.4 LOCA Supporting Information

1.4.1 This accident scenario models an RCS leak outside of containment;

1.4.2 The "Plant Vent Exhaust Contributors" and "Fuel Building Exhaust Contributors" should be reviewed to ensure the correct release path(s) are being used.

1.4.2.1 Note that a SIAS will route any activity from the lower level Auxiliary Building Ventilation (below 100') through the Fuel Building Essential Filters. This activity will be released via the Fuel Building Stack and monitored by RU-145/146, with the above 100' levels of the Auxiliary Building being released via the Plant Vent Stack and monitored by RU-143/144.

1.4.3 Fuel Building Vent Stack: leakage activity is released through the Fuel Building Vent Stack and monitored by RU-145/146 or FB PASP.

1.4.3.1 An accident involving elevated Fuel Building activity due to a Spent Fuel bundle leak should be modeled under "Fuel Handling Accident" which utilizes a different source term mix is used.

1.4.4 Plant Vent Stack: Leakage activity is released through the Plant Vent Stack and monitored by RU-143/144 or the PV PASP;

1.4.4.1 An accident involving elevated CARS (Condenser Air Removal System) activity should be modeled under "Steam Generator Tube Rupture 1%" or Steam Generator Tube Rupture 100%" which utilizes a different source term mix.

1.4.4.2 Typical sources from Auxiliary Building Equipment include Letdown System leaks, Sample System leaks, Gas Stripper leaks, etc.

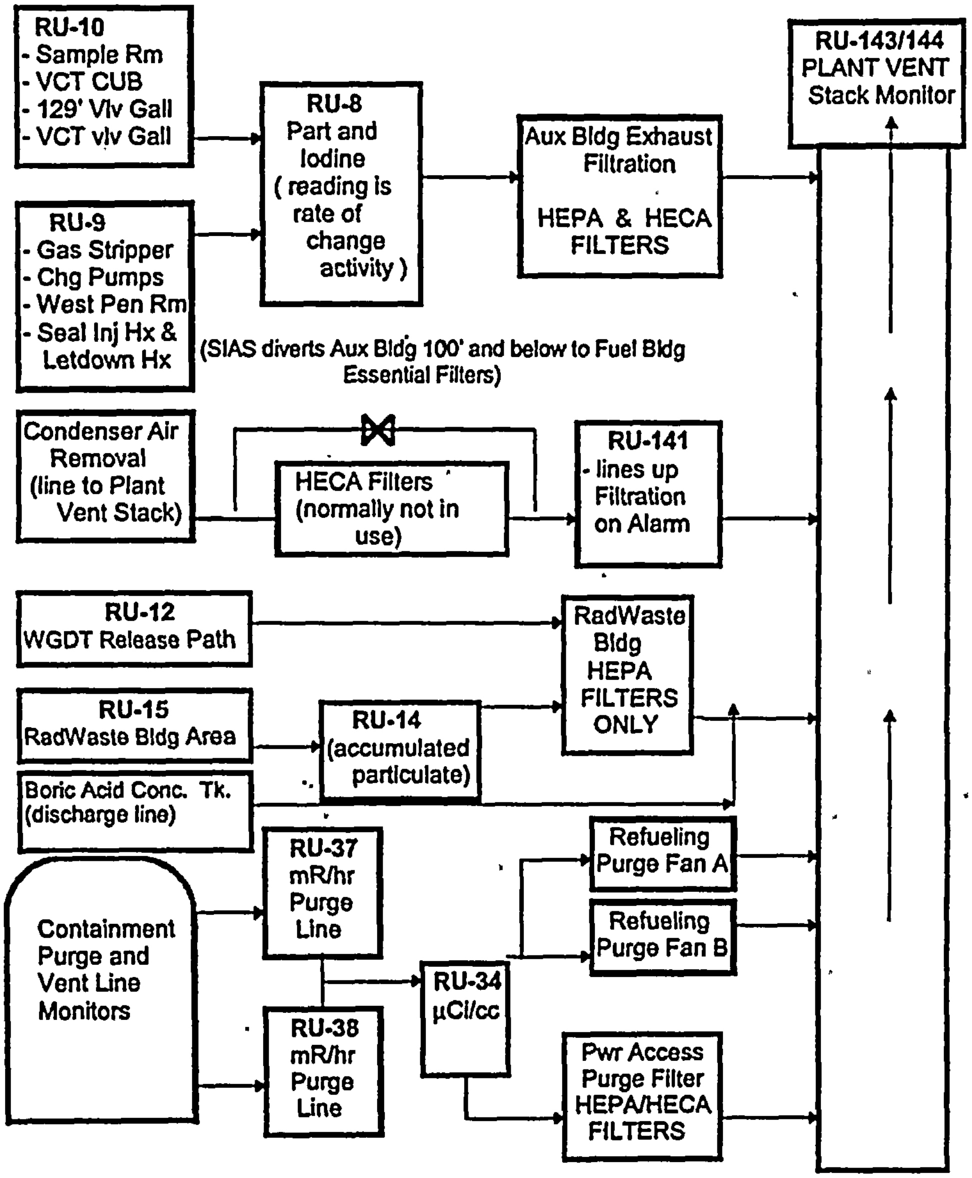
1.4.4.3 The RadWaste Building ventilation exhaust is routed to the Plant Vent Stack. Contributions from the RadWaste Building include the building ventilation, waste gas decay tank discharges and boric acid concentrator discharges. There is no iodine filtration on this release path.

1.4.4.4 An accident involving a Surge Tank or any WGDT which has been isolated for less than 45 days should be modeled as a LOCA 1% to project iodine activity.

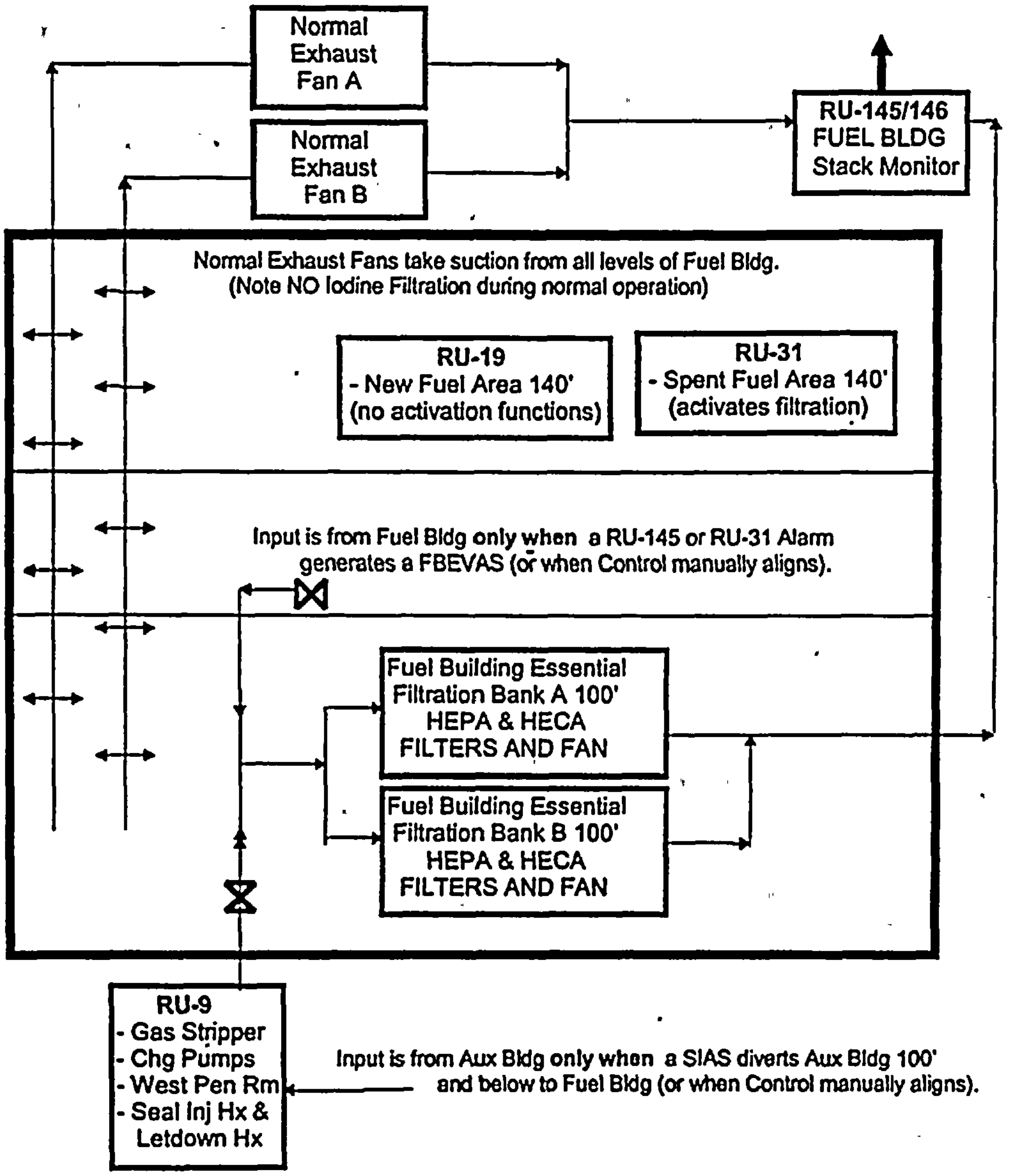
1.4.4.5 A third major source is from the Containment Purge System: a Containment Refueling Purge (non-filtered), a Power Access Purge (filtered) or a Non-Standard Containment Purge (filtered) all release via the Plant Vent Stack.

1.4.4.6 Use of the LOCA 100% accident assumes that an RCS leak has occurred with > 10% cladding failure resulting in significant iodine levels.

1.4.5 Plant Vent Exhaust Contributors



1.4.6 Fuel Building Exhaust Contributors



1.4.7 Basis for Default Ventilation Flow Data

For the Plant Vent	**Stack Flow**	**Default Assumptions**
If fan or pump is running	Maximum rated flow	For Plant Vent:
HAN-J01A (Aux Bldg Normal)	30,000 cfm	
HAN-J01B " " "	30,000 cfm	If Refueling Purge is not operating, 1.13E5 CFM would be the Maximum Default.
	60,000 cfm total	
HRN-J01A (RadWaste Bldg. Normal)	25,500 cfm	1.46E5 CFM with Refueling Purge Operating.
HRN-J01B " " "	25,500 cfm	
	51,000 cfm total	
CPN-J01A (Cnmt.Refueling Purge)	16,500 cfm	
CPN-J01B " " "	16,500 cfm	
CPN-J02 (Cnmt. Power Access Purge)	2,200 cfm	
	35,200 cfm	NOTE:
Condenser Air Removal Pump A	60 cfm	The above defaults include 1540 cfm from the Condenser; while the 2200 cfm from the Cnmt. Power Access Purge is not included.
" " " " B	60 cfm	
" " " " C	60 cfm	
" " " " D	60 cfm	
Gland Steam Exhaust Blower	1300 cfm	
	1540 cfm total	
For Fuel Building Vent	**Stack Flow**	For Fuel Building
If fan is running	Maximum Rated Flow	
HFN-J01A (Normal)	21,750 cfm	43,500 CFM if Normal Fans are operating.
HFN-J01B "	21,750 cfm	
	43,500 cfm total	
HFA-J01 (Essential)	6000 cfm	12,000 CFM if Essential Fans are operating.
HFB-J02 "	6000 cfm	
	12,000 cfm total	

1.5 Fuel Handling Accident Supporting Information

1.5.1 The accident assumption is that a Fuel Handling accident has occurred releasing activity from a fuel bundle. A Fuel Handling accident is considered to be primarily a noble gas cloud and the mix used by Mesorem reflects this. The immediate concern would center primarily onsite.

1.5.2 The mix assumes that virtually all the released activity will be decayed down to primarily Xe-133 and Kr-85, and that all Iodine will be decayed to Iodine 131.

1.5.3 Fuel Building

1.5.3.1 The release is postulated to pass through the Fuel Building Essential Filters enroute to the Fuel Building Vent Stack, where it will be monitored by RU-145/146 or the FB PASP (a FBEVAS or manual operation of Essential Filters is required for iodine filtration; iodine filtration lineups and flowrates should always be verified with Operations).

1.5.4 Containment Building

1.5.4.1 Fuel Handling accident; the release is postulated to pass through the 42" Refueling Purge lines enroute to the Plant Vent Stack, where it will be monitored by RU-143/144 or the PV PASP (the containment may be isolated and/or the purge stopped in short order in such a case; if so, the "Isolated Containment" should then be used to project dose at Site Boundary).

1.5.5 SCRAM TIME

1.5.5.1 For the "Has Reactor Been Scrammed?" prompt:

- The answer to the prompt should always be "Y" as the fuel bundle will no longer be critical ("Y" tells the program to start decaying the mix).

1.5.5.2 For the elapsed time since scram prompt:

- The number of hours and minutes since the fuel bundle has been critical should be entered. An accurate entry of hour and minutes will not be immediately available; a conservative default time to use for decay would be the time the reactor was shutdown for the most recent refueling outage (maximum allowable number of hours is 999.00 - hours greater than 168 will have an insignificant impact on the calculation).

1.6 Waste Gas Decay Tank

1.6.1 The accident assumption is that the Waste Gas Decay Tank has been isolated from the gas header and Surge Tank. The release would be through the RadWaste Building HEPA filters and monitored by the Plant Vent Stack RU-143/144 or PASP monitor. Per the UFSAR analysis of a rapid release using maximum inventory, the iodine dose would be 3 mRem or less at Site Boundary; therefore no iodines are projected. For a Surge Tank or any online tank or pathway gaseous release which may contain significant iodine activity (has been isolated for < 45 days) use the " LOCA 1%" scenario.

1.6.2 SCRAM TIME

1.6.2.1 For the prompt "Enter number of hours and minutes since the tank has been isolated ":

- The Shift RadWaste Building Operator will provide the time since the tank has been isolated (if the time is not readily available use the default of 999 hours).

1.7 Unmonitored release

1.7.1 General notes

1.7.1.1 Typical accident assumptions would be that a release is occurring which is not monitored by an RMS monitor, nor is there a flow rate available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release would be a ruptured tank in the RadWaste Yard which contained radioactive liquids; an outside fire involving radioactive waste, an accident involving a waste shipment on site, an accident in the Radwaste Storage Building, etc. In all those cases, release rates would typically be relatively low, but the potential does exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a Mesorem projection until actual Site Boundary data is available. The below information may be used to supplement the Dose Projection guidance.

1.7.2 Categorize - Fit the release into one of the below three conditions and follow the direction.

1.7.2.1 Primarily Noble Gas- with neither iodines nor particulates being significant contributors (a ruptured liquid outside storage tank, a fuel handling accident or waste gas tank accident being release through an open roll-up door, breach in wall, etc., a system/tank vent in containment during an outage with outside hatch).

- These can be modeled by using a WGDT (you are fairly certain there is no iodine present) or Fuel Handling accident (if there may be small amounts of iodine being released) selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.2 Noble Gases and Iodines - with particulates not being a significant contributor (a breach in the Aux. Bldg/Fuel Bldg. during LOCA conditions, degassing of a major tank/system volume in containment during an outage with outside hatch open).

- These can be modeled by using a LOCA accident selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.3 Primarily Particulates - with noble gas and iodines not being significant contributors (a fire involving compacted waste, resins, etc.).

- Mesorem will be of limited usefulness in this situation. Follow the direction on the next page to obtain an initial PAR.

1.7.3 Particulate Release - The Mesorem Jr. built-in projections will not model a particulate only release. However, the plume "footprint" as developed by Mesorem from current Met data will be useful, and a projection should first be run for this purpose (using any accident scenario). The Chi/Q values generated in this projection will be used to develop Site Boundary dose estimates, per the following methodology.

1.7.4 Plume footprint - Perform a LOCA 1% Mesorem run using actual meteorological data (all other inputs are unimportant at this point). Obtain the printout.

1.7.5 Release Rate - Determine the best estimate of the number of Curies involved in this release per RadWaste paperwork and/or RadWaste Group. Use this total curie number and estimate how quickly the material is being released.

1.7.5.1 Example: a group of 55 Gal Drums is burning. Reviewing the paperwork with RadWaste indicates a total of 12 Curies are involved. Estimates from Fire Protection at the scene indicate they expect the total fire time to be 60 minutes. Assuming that all 12 Curies will eventually be released, the release rate would be 12 Ci/60 Min or 12 Ci/3600 Seconds or 3.33E-3 Ci/Sec.

1.7.6 Dose Conversion Factor - Per the R/W paperwork select a Dose Conversion Factor (from DCFs below). These represent TEDE dose based on annual waste stream sample analysis.

DCF per Waste Category (Rem-M^3/Ci-hr)	Unit 1	Unit 2	Unit 3
Dry Active Waste (*55 Gal Drums*)	4.08E5	8.26E4	1.08E5
Resin Lo Level	2.76E5	7.35E4	7.91E4
Resin Hi Level	8.05E4	6.02E4	5.62E4
Process Filters	1.76E5	3.29E4	5.02E4
Concentrate	3.75E5	1.07E5	6.90E4
Tri-Nuke Filters	2.10E5	5.98E4	5.68E4
Resin Condensate Demins	5.69E4	5.69E4	5.69E4
Resin Blowdown	1.41E5	6.24E4	6.24E4

1.7.7 Then: __________ Ci/Sec (estimated release rate) X ______________ receptor Sec/M3 = ________ Ci/M3 X ____________ Rem-M3/Ci-hr = _______ Rem/hr in TEDE at the receptor.
where: the Sec/M3 is the Chi/Q at the receptor site (normally Site Boundary but may be used for any receptor point) and taken from the Mesorem printout you directed per current Met. data.

1.7.8 Followup actions

1.7.8.1 Expedite efforts to obtain grab samples and detailed dose rate readings (accurate times samples are taken and specific locations of samples and dose rates will be crucial for later reconstruction of release). For tanks, waste shipments, etc., there may be isotopic analysis of contents available, and these should be obtained for Technical Staff use.

1.7.8.2 Direct actions to isolate event onsite with appropriate radiological postings; have word passed as required for protection of Onsite personnel; provide airborne ingestion and inhalation protection for the responding staff in a conservative manner until field samples are available.

1.7.8.3 Fax isotopic information to ARRA as it becomes available; the RASCAL Dose Assessment Program used by ARRA has some options to input particulates which Mesorem does not.

1.7.8.4 Whole Body Count field teams and other selected available personnel who have been in or near the plume. This information can assist in the recreation of the event (e.g., negative results might show no release occurred).

1.7.8.5 Whole Body Count data can be used to determine the skin dose received by an individual in cases where individuals immersed in a plume may have received high noble gas exposures. Such individuals should be brought in and the dosimetry department directed to perform the appropriate body count and analysis.

1.8 Source Term Monitoring

1.8.1 Need to verify source term

1.8.1.1 "The largest single component of uncertainty is expected in the estimate of the source term"; "Dose projections should be viewed only as rough estimates"; "It is apparent that, overall, the best that can be expected early in an accident release sequence is that projected doses may be within a factor of 10 of the doses based on field monitoring; it is likely that they will be less accurate" - these statements are all from NUREG/CR-5247, RASCAL Version 2.1 User's Guide. Radiological Assessment System for Consequence AnaLysis is the USNRC's Dose Assessment Program, and the cautions apply to us as well as them.

1.8.1.2 Training Drills and Exercises are conducted with data that correlates well. This is a necessity if the training is to be effective, although not realistic. Expect to have to make a correlation adjustment in actual conditions.

1.8.2 Initial actions

1.8.2.1 Direct sampling to allow comparisons of actual samples to the Iodine/Noble gas ratios and mixtures used by Mesorem.

1.8.2.2 Ensure that grab samples are obtained from the onsite release source, whether via the stack monitor sampling rig, or by local samples.

1.8.2.3 Verify filtration is in effect and fuel condition assumptions are correct.

1.8.3 Comparison actions

1.8.3.1 RO2/2A Closed Window readings may be compared to the calculated mRem/hr (external EDE) readings at a specific location.

1.8.3.2 The initial Particulate and Iodine μCi/cc values will be radioed in by the field teams (these readings are converted from cpm/min to a gross μCi/cc value based on I-131 equivalent energy). The Iodine cartridge mCi/cc level may be used as a Rem/hr approximation for comparison with the projected Thyroid CDE value at that same point.

1.8.3.3 A worksheet to accomplish the above comparisons follows on the next page.

1.8.3.4 As soon as possible, a centerline sample should be brought onsite for an isotopic analysis. The total μCi/cc from Noble Gases and Iodines may be used by the RAC Staff to back-calculate the source term or determine the external EDE/TEDE ratio.

1.8.4 Corrective actions

1.8.4.1 If the I/NG ratio and mix in Mesorem are close to the actual composition, adjust the Mesorem projection by repeated runs, varying the RMS value until projected data agrees with the field data.

1.8.4.2 If the I/NG ratio and/or the mix need adjustment, obtain the isotopic analysis of the sample that best fits the current situation. Per Section 4.0, page 18, "Running a Projection Using Grab Sample Data" direction, obtain an updated projection reflecting the actual source term. Note that the RMS value entered may not match the activity calculated per the sample. Mesorem will alert you to that fact by pointing out whether the entered RMS value is high or low, and then asking if you want to continue. Continue to obtain a projection based on that specific mix.

1.8.5 MESOREM receptor comparison worksheet

1.8.5.1 As early as possible, verify that the projection is reasonable by comparing actual field results to projected. This worksheet provides a simple way to convert the projected readings to numbers that can be readily compared to field readings. Results and thought processes are to be entered in the formal log for record keeping purposes.

1.8.5.2 Direct the teams to call in closed window (CW) dose rates (equal to external EDE) and a gross iodine µCi/cc based on the frisker reading taken on a air sample silverzeolite cartridge.

1.8.5.3 Make sure the readings used are CENTERLINE (C/L) and are a reasonable time match (if the sample was taken at Site Boundary, and the plume took ~30 minutes to reach Site boundary, then the Mesorem projection used for comparison purposes should have been done about ~30 minutes ago).

1.8.5.4 Comparison

ACTUAL	PROJECTED
Field Reading @ ______ miles	Projected Reading @ ______ miles
CW ______ mR/hr	External EDE ______ mR/hr
Gross Iodine ______ µCi/cc	Projected Iodine ______ µCi/cc

Where "Projected Iodine" is equal to

______ sec/m3	x ______ µCi/sec	^{3} 1 E6	= ______ µCi/cc
(DCHI/Q) from Page 1 MESOREM print-out; additional distances require setting a DYNAMIC Receptor at that field location for the projection.	(Release Rate) from Page 4 MESOREM print-out; use the I, not NG, release rate (same release rate applies to all distances).	Conversion constant (µCi/m3 to µCi/cc)	The Projected Iodine per MESOREM, Jr.

1.9 External EDE/TEDE Ratios

1.9.1 Need for ratios

1.9.1.1 An immediate need as Onsite and Offsite Field Teams are dispatched is to provide the teams with TEDE dose limits (EPA guidance and recommendations on dose limits for workers during emergencies is detailed in Appendix K - Emergency Exposures and KI) and a means to remain within those limits using only SID and dose rate meter readings (external EDE values).

1.9.1.2 In addition, in severe accidents the Thyroid CDE dose needs to be monitored for KI administration (if > 25 Rem).

1.9.2 TEDE Dose

1.9.2.1 As calculated by Mesorem and per EPA guidance TEDE is the external EDE dose summed with the CEDE dose. Determine the TEDE Dose limit to be applied for each Field Team (per a review of section Appendix K - Emergency Exposures and KI).

1.9.3 Lo CEDE Dose

1.9.3.1 In releases which are primarily Noble Gas with minimal Iodine levels (low CEDE value) the ratio of external EDE to TEDE will approach "1" and no correction to the SID reading will be required. Determine desired TEDE Limit for each team and direct them to use un-corrected SID Dose to remain within that limit.

1.9.4 Hi CEDE Dose

1.9.4.1 In releases with significant iodine levels, the CEDE will become larger and the ratio of the SID reading (external EDE) to TEDE will become less than one. Per EPA recommendations in such cases, the TEDE dose limit should be ratioed down to provide effective TEDE dose control via control of External EDE. Determine desired TEDE Limit for each team and determine the working SID Dose to remain within that limit per below direction.

1.9.5 EDE/TEDE calculation

1.9.5.1 An initial external EDE/TEDE ratio using the Mesorem projection data can be done, remembering that it is critical that the data is selected for the distance from the Site that the Field Team will be operating. Use the "MAX" distance value (the .25 mile data from page one on the printout) for Onsite Teams. As soon as actual field data becomes available the ratio should be checked and updated.

ratio = $\frac{\text{external EDE}}{\text{TEDE}}$ (value from page 1 of the Mesorem printout in mR/Hr)
(value from page 1 of the Mesorem printout in mR/Hr)

other values available via PAR Receptor information

1.9.6 Working Limit

1.9.6.1 Multiply the desired TEDE limit for that person or Team by the ratio above; issue the reduced working limit in mRem.

1.9.7 Thyroid CDE Dose Control

1.9.7.1 Determine an appropriate expected Thyroid dose for each Field Team using the Mesorem page 1 projection data initially (dose rates assume C/L exposure for 1 hour). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.2 If the potential Thyroid dose approaches 25 Rem, consider ways to reduce dose; if necessary issue KI (Potassium Iodide). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.3 As soon as actual field data becomes available the expected dose should be checked and updated.

1.9.8 Thyroid CDE from field readings

1.9.8.1 Frisker readings converted to µCi/cc Iodine equivalent can be used to generate an estimated Thyroid CDE rate in Rem/hr from a field sample. Or, the Gross Iodine activity from a completed analysis on that sample may also be used for estimates.

1.9.8.2 Methodology - Multiply the air sample charcoal frisker reading or the total iodine activity from the isotopic analysis (in µCi/cc) times the appropriate conversion factor (in Rem-cc/hr-µCi). Note that the 100% factors are less than the 1% factors due to mix differences.
Sample taken at ____ miles from Site @ ____ degrees from "0" degrees North
Sample taken @ _______ Time on ___________ Date

_______________ µCi/cc X __________ $\frac{\text{Rem-cc}}{\text{hr-µCi}}$ = __________ Thyroid CDE in Rem/hr

1.9.9 Rem-cc/hr-µCi - When Effective Age falls between 2 listed numbers, use the higher age. Select 1% failed fuel unless plant conditions indicate severe (>10%) fuel cladding failure.

Receptor Effective Age (hrs)	1% Failed Fuel	100% Failed Fuel
0-4	6.0 E 5	3.5 E 5
>4-10	7:0 E 5	5.0 E 5
>10-24	9.0 E 5	7.0 E 5
>24	1.1 E 6	1.0 E 6

1.9.10 Application - Note that this methodology can be used Onsite and Inplant as well as for Offsite teams to estimate initial exposure and provide conservative controls. Detailed individual exposure tracking utilizing normal Site procedure should be initiated as soon as practical.

1.10 Mesorem Jr. Specialized Functions

1.10.1 USE OF "COMMAND MENU" OPTIONS

1.10.1.1 F1 - Update Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Update" allows changing the data similar to redoing a projection, and is usually faster. The projection will then have to be run again; see following instructions on Execute Dispersion Model. Note that redoing the entire projection from the "Execute Dispersion Model" selection will accomplish the same result and may be the simpler approach.

Additional options available are:

1. "F1-Meteorology Data File" allows you to enter precipitation (in/hr) if desired; the precipitation rate is available as a 15 minute rate or as an hourly total on the line printer at the Met Tower. Send an I&C Tech out to obtain the in/hr data.

2. "F5-Receptor Data File" allows you to review the entire list of receptors; or to add, update/display or delete existing receptors. This option is useful to match field data more exactly to a projection; and to calculate a PAR for a specific point not on the receptor list.

1.10.1.2 F2 - Execute Dispersion Model: offers two choices, "F1 - Fast Mode A and update from sequential screens" or "F2 - Mode A and execute model from edited files". "F1" is the normal mode. Use "F2" to run a projection after the files have been edited using the above "Update" selection.

1.10.1.3 F3 - Mode Selection [A or B]: Mode A is always used in the Units and to provide PARS in the EOF; Mode B can be used with the assistance of the Eplan Coordinators if desired.

1.10.1.4 F4 - Display Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Display" allows reviewing the data without the risk of inadvertently changing it.

1.10.1.5 F5 - Back-calculate Source Term: selecting this allows two options "Press A to select the external EDE/TEDE ratio" or "Press B to select Back-calculation of source term". See page 25 for specific direction on these options.

1.10.1.6 F6 - Graphic Display: This selection graphically depicts the plume over a map of the 10 mile EPZ. Selecting this option will allow graphing four different overlays: F1 - External EDE Rate (Immersion) F2 - Adult Thyroid CDE Rate (Inhalation), F3 - Iodine Deposition and F4 - CHI/Q Values.

- The legend supplied with the graph provides the data for the three segments the plume is divided into. The inner segment is provided with one value indicating the peak activity; the next two segments have two values indicating the inner and the outer edge values for that segment; and the "blue" values provided indicate the rates outside the plume and up to it.
- An "ETA" value (Estimated Time of Arrival) gives the time it will take for the plume to reach the 10 mile boundary using the projection wind speed and the assumption that the release has just begun.
- Use the "F2 - Plot" choice to obtain a printout; Use the "F1 - Menu" to exit to the menu. As the wind conditions change a series of graphs should be run and kept as ongoing records of areas potentially contaminated. This will aid the recovery phase.

1.10.1.7 F7 - Password Utility: Used by Emergency Planning Group to set password.

1.10.2 USE OF "RECEPTOR DISPLAY MENU" OPTIONS

1.10.2.1 F1 - External EDE Rate (Immersion): gives the external EDE from plume shine (does not include 4 day deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.2 F2 - Adult Thyroid CDE Rate (Inhalation): gives the Thyroid CDE Rate for all receptors within the designated sectors (normally three).

1.10.2.3 F3 - TEDE Rate (Inhalation): gives the TEDE based on inhalation only (no deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.4 F4 - Protective Action Recommendations and Guides: starts with Site Boundary PAR data as listed on page 2 of the Mesorem printout; then provides PAR Data for all receptors (a review of the following complete receptor list to determine receptors of interest should be done prior to using this option as it is time consuming to scroll through the screens and you cannot scroll back).

- Each receptor will be given Shelter and Evacuation TEDE and TODE dose. The TEDE Dose includes the Inhalation and the 4 Day Deposition Dose for both the Shelter and Evacuation PARS. The Evacuation Dose will therefore be conservative. The minimum or "no dose" value provided will be shown as "< .02" and recommendations will be made as appropriate, including KI Administration.

- The Plume Arrival time in hours is given for each receptor. The time given assumes the release

- May be added as necessary per the "Update Data" option (guidance is on page 2 of this Appendix).

1.10.2.5 F5 - Iodine Deposition Rate: Provides the iodine deposition rate in µCi/m3-sec for all receptors within the designated sectors (normally three). This information will be useful to ARRA and dairy farms in high deposition areas are of particular interest.

1.10.2.6 F6 - CHI/Q Values: Provides the CHI/Q (sec/m3) value for all receptors within the designated sectors (normally three).

1.10.2.7 F7 - Receptor Locations: Provides the same information as the following complete receptor list.

1.10.2.8 Q - Leave Receptor Display Menu: READ THIS PROMPT CAREFULLY!! Selecting "Q" from the Receptor Display Menu will provide the prompt "Do you wish to perform another forecast [Y/N]" ONLY ANSWER "Y" when you are ready to delete the current projection data and start a new projection (begin again). IF YOU WANT TO CONTINUE WORKING WITH THE CURRENT PROJECTION DATA, REVIEW RECEPTOR DATA, PRINT GRAPHS, ETC. enter "N".

1.10.3 PARs for all receptor locations

1.10.3.1 Shelter Dose values and Evacuation Dose values for TEDE and TODE are calculated for about 175 receptor locations beyond the Site Boundary. Although Mesorem automatically reports only the Site Boundary PAR and associated Data on the screen or printout, the additional receptor data can easily be obtained.

1.10.3.2 The complete list of receptor locations is included in this section (they may also be reviewed by selecting "Receptor Locations" on the Receptor Display menu).

1.10.3.3 The Shelter Dose and Evacuation Dose TEDE and TODE values, the Plume Arrival Time, along with the Protective Action Recommendations (including stable iodine administration), may be obtained for any of these receptors by selecting "Protective Action Recommendations and Guides" on the Receptor Display menu.

1.10.4 Receptor display

1.10.4.1 The Receptor Display menu is obtained 3 ways:

1. It appears following the output of a single projection, once one answers "No" to the question "Will this be a simultaneous release?"
2. It appears following the output of a simultaneous projection, once one answers "No" to the question "Do you want to consider other release points?"
3. If back at the Command Menu, select "Display Data", then select "Receptor Data File" on the File Menu.

1.10.4.2 Scrolling - Note that Mesorem Jr. will scroll in order through all the receptor sites starting at Sector "A" and that you cannot scroll back! If you miss the ones you need you will have to start over. Review the following list to be aware of when points will be coming up.

1.10.5 Additional receptors

1.10.5.1 Should none of the existing receptor locations serve the need, one of the "dynamic" receptors (having designation "DY01 thru DY24") may be used for the needed location:

- Select "F1 - Update Data" on the Command menu; then
- Select "F5 - Receptor Data File" on the File menu; then
- Select "F2 - Update/Display a Receptor" on the Receptor Utilities menu
- Use one of the "DY" numbers and enter the required data (note that the "angle" called for is a compass heading from PVNGS to the receptor location desired; where Sector "A" centerline is 0°, and Sector "E" centerline is 90°, etc).
- Once this is done, Mesorem Jr. will calculate doses for the new receptor location.

1.10.5.2 Note that the "Dyxx" Receptor Data will always appear at the end of the receptor display list rather than be placed in the appropriate sector with the permanent individual receptors.

1.10.5.3 List of Receptors

RECEPTOR NAME	DIRECTION	ANGLE (deg)	DISTANCE (mi)	COMMENTS
Site Boundary "A"	N	000.0	00.60	SB, 2, 5, 10,15,20,30,40,50 distances
SC02	N	000.0	07.00	Ruth Fischer School
Site Boundary "B"	NNE	022.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "C"	NE	045.0	01.58	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "D"	ENE	067.5	01.37	SB, 2, 5, 10,15,20,30,40,50 distances
FM05	ENE	075.0	09.00	J.A. Woods Farms
DA04	ENE	071.9	11.62	Stotz Dairy Farm
DA05	ENE	071.9	11.61	Crosswinds Dairy
DA14	ENE	070.6	26.48	Advantage Farms
DA15	ENE	070.4	25.82	Eyherabide I
DA28	ENE	069.6	30.74	La Salvia, Jerome
OF03	ENE	066.0	35.00	APS El Mirage Office
DA16	ENE	081.4	21.37	Van Leeuwen, G.
Site Boundary "E"	E	090.0	01.34	SB, 2, 5, 10,15,20,30,40,50,60 distances
70E	E	090.0	70.00	Apache Junction
85E	E	090.0	85.00	E of Apache Junction
RS01	E	086.0	03.00	Adams Residence
OF01	E	097.0	15.00	APS Buckeye Office
OF02	E	084.0	30.00	APS Goodyear Office
FM03	E	088.0	15.00	Cambron Farm
FM04	E	095.0	09.00	Cooley Farms
DA01	E	092.6	11.06	A&H Dairy
DA02	E	087.3	10.72	Butler Living Trust
DA03	E	086.1	11.07	B&K Dairy
DA06	E	100.0	12.84	Kerr, William
DA07	E	087.4	17.31	Dickman Dairy
DA08	E	087.4	17.31	Eyherabide II
DA09	E	092.3	19.86	Kerr, David Dairy
DA10	E	093.4	20.04	Kerr, John W. Jr.
DA11	E	092.4	19.22	Lamcrest Enterprises
DA12	E	093.6	19.25	Tumbleweed Dairy
DA13	E	093.4	20.20	Hillcrest II
DA17	E	084.9	22.66	Desert View Dairy
DA18	E	088.8	23.69	Bolle & Henry Dairy
DA19	E	089.0	23.69	Heartland VI
DA20	E	092.2	20.82	Triple J (J. Kerr)
DA21	E	095.7	20.91	Dykstra Dairy
DA22	E	093.4	21.81	Botma, Randy
DA23	E	095.0	23.14	T&K Investments III
Site Boundary "F"	ESE	112.5	01.28	SB, 2, 5, 10,15,20,30,40,50 distances
SC01	ESE	105.0	11.00	Palo Verde School
RS02	ESE	106.0	04.00	Wedgeworth Residence
FM01	ESE	122.0	05.00	Desert Farms
DA25	ESE	104.1	22.28	Rainbow Valley North
DA26	ESE	104.1	22.28	Rainbow Valley South
DA24	ESE	100.6	21.66	Kuiper, Darrell
DA27	ESE	106.23	23.00	Western Sky Diary
Site Boundary "G"	SE	135.0	01.31	SB, 2, 5, 10,15,20,30,40,50 distances
SC03	SE	144.0	08.00	Arlington School
Site Boundary "H"	SSE	157.5	01.88	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "J"	S	180.0	01.68	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "K"	SSW	202.5	01.14	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "L"	SW	225.0	00.75	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "M"	WSW	247.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "N"	W	270.0	00.62	SB, 2, 5, 10,15,20,30,40,50 distances
SC04	W	281.0	22.00	Harquahala Valley School
Site Boundary "P"	WNW	292.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "Q"	NW	315.0	00.74	SB, 2, 5, 10,15,20,30,40,50 distances
MO2	NW	323.0	09.00	MacArthur's Farm
Site Boundary "R"	NNW	337.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
DY01-DY24	Variable	Variable	Variable	Available Dynamic Receptors

1.10.6 Back-calculating source term - Use of the F5 - Back-calculate Source Term? Selecting this will provide the "A" and "B" options on the Command Menu as follows:

1.10.6.1 OPTION "A" - Used to adjust specific area EDE/TEDE ratios. If Noble Gas and I/NG µCi/cc Iodine field air sample data in gross µCi/cc become available the "Press A to select the external EDE/TEDE ratio" option may be used. This option is of limited early use as Noble Gas Isotopic values are required.

- The prompts will be for (a) the noble gas and iodine levels in gross µCi/cc (an MCA analysis will be required for noble gas although gross iodine activity will be available from field frisker readings); (b) the distance the sample was taken in miles from Site; and (c) the angle the sample was taken in relation to "0" degrees North. Note that samples taken outside the sectors used in the projection will not be accepted.
- The completed calculation provides comparison between the actual and the projected air sample data at that point (in gross µCi/cc) as well as a specific external EDE/TEDE ratio for that sample area. Use the updated ratio for that team and make adjustments to the team dose limits as appropriate. Thyroid CDE will also be provided.

1.10.6.2 OPTION "B" - Use to develop data to update the source term: As the initial Field Team dose rates become available (closed window mRem/hr at a known distance from Site center and the angle between the field dose rate and "0" degrees North) they may be entered into Mesorem via the "Press B to select Back-calculation of source term" option. This option will be of use during the early event phase as field dose rates will be the first information available defining the plume.

- The prompts will be for the field reading in mRem/hr (closed window); then the distance in miles from Site; and the angle the reading was taken in relation to "0" degrees North (Note that readings found outside the sectors used in the projection will not be accepted).
- The completed calculation provides the projected versus actual field reading at the same point for comparison; as well as projected and adjusted release rates. Several field samples should be collected prior to source term adjustment which is then done by repeated Mesorem Jr. runs until a "best fit" of the accumulated data is obtained.

1.10.7 Running a projection using grab sample data

1.10.7.1 Run projection as normal until the "Breakdown Menu" display appears - select: F1 - Grab Sample Analysis Complete: isotopic data from a stack or field sample is available, and the projection will be calculated based on a corrected mix per the grab sample activity.

- The prompt "Do you wish to utilize current isotopic mix?" may appear after you choose one of the following selections. The question is only asked after the initial projection in a series of projections has been run; and allows you to keep the current mix - (Y) - if you want to keep the current mix, or - (N) - if you want to change the current mix.

- Although the isotopic sample data entered will be used in this choice to calculate a projection dose, the program still prompts for an RMS reading. Reason: the monitor reading entry is used by Mesorem to calculate a comparison source term when you elect to change the mix concentrations or the release rates. After the mix concentrations or release rate data is entered and before the printout is done, Mesorem will display a message indicating whether the updated source term will be > or < than the source term the RMS reading would provide. The program will then ask if you want to continue the projection using the entered concentrations. This comparison provides the ability to work up a release per a specified mix that equates to a specific RMS monitor reading, via multiple backfit calculations. Normally you will enter "Y" to continue the projection.

1.10.7.2 Data entry - The program prompts for the entry of the RMS monitor information, process flow rate and filter efficiency. Answer the prompts. The "Isotopic Mix Menu" appears. On the "Isotopic Mix Menu," three choices are offered:

1. F1 enter isotopic grab sample activity by % of total. Enter the % abundance for the five iodine isotopes, followed by the 13 noble gas isotopes; remembering each group must total 100.

2. F2 enter sample activity in µCi/cc concentration by isotope. Enter the µCi/cc concentration for each isotope - the µCi/cc units are not noted, but that is the format to be used.

3. F3 enter sample activity in release rate by isotope. Enter the µCi/sec release rate for each isotope <u>not</u> µCi/cc.

1.10.7.3 Sample decay - For the "Enter the time that the sample was analyzed" prompt, be aware that the DECAY completed analysis will already have been decay corrected back to the sample collection time. Enter the time between reactor scram and sample collection; or "00:00" if reactor was critical at sample collection time.

1.10.7.4 Finish projection - Step through the remaining steps and the new calculation will reflect the updated mix.

1.10.8 Technical Basis Information

1.10.8.1 MESOREM, Jr. developmental references

1. EPA 400-R-92-001, "Manual of Protective Action Guides And Protective Actions for Nuclear Incidents," October 1991

2. EPA 520/1-88-020, "Federal Guidance Report No. 11 Limiting Values of Radionuclide Intake and Air Concentration and dose Conversion Factors for Inhalation, Submersion, and Ingestion," U.S. Environmental Protection Agency, 1988.

3. Reg Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I."

4. NUREG/CR-3344 (PNL-4753), "MESOI Version 2.0: An Interactive Mesoscale Lagrangian Puff Dispersion Model with Deposition and Decay," Pacific Northwest Laboratory, 1983.

5. NUREG/CR-2858, "PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations," November 1982.

6. NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", November 1980.

7. MESOREM, Jr. Background Materials, Program Documentation, Source Code, Programmers Manual, Software Validation Report, Site Verification, and Mesocode Book of Changes on file in the Emergency Planning Department.

1.10.8.2 Some basic information

- All releases are at ground level.
- The stability class is determined using a Delta T from the 35' and 200' Met tower readings.
- The FSAR isotopic mix values for 1% and 100% "Failed Fuel" LOCA and 1% and 100% SGTR are used as conservative for dose projections.
- Mesorem Jr. Chi/Q values are from Desert dispersion parameters as referenced in NUREG/CR-2858.

1.10.8.3 Projection type - In Mode "A", a straight line Gaussian plume projection is calculated and decay corrected doses are provided for the Site Boundary; 2, 5 and 10 mile distances.

1.10.8.4 Release rate determination - A Mesorem calculation is based on Site RMS indications. The current uCi/cc concentration per the release stack Noble Gas Monitor is input along with the flow through that release point. These are converted to a Noble Gas release rate; and the Iodine release rate is then calculated using the FSAR I/NG mix ratios. Iodine filtration efficiency is assumed to be 95% but may be entered as less if needed.

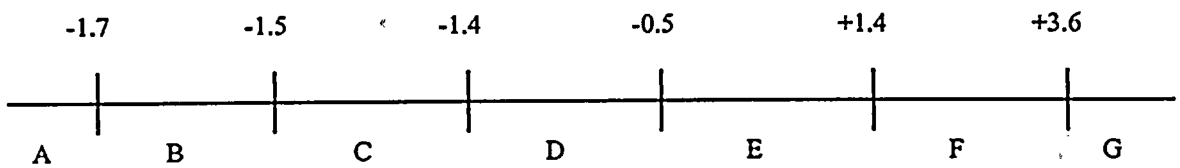
1.10.9 Definitions/Miscellaneous

1.10.9.1 Meteorological tower data - The Site Meteorological Tower data needed for dose projection is available on ERFDADS; if the ERFDADS data is unavailable, there are two alternative sources of data prior to falling back on the "default" data entered into Mesorem Jr. The alternative choices should always be used if time permits.

- Choice 2: call the National Weather Service (602-379-4609 or 602-379-4611). They can provide Wind Speed, Wind Direction and Temperature based on information from the tower in the onsite SRP Switchyard area. Use that data to determine an appropriate delta "T" from the table below.
- Choice 1: send an Operator, I&C Tech or RP Tech out to the Met Tower to obtain the data locally: (keys to the tower area are available in Unit 1 and each RFAT).

1.10.9.2 Stability Classification - The delta T is calculated per the below formula in MESOREM Jr.

delta T in °F
If the delta T falls exactly on a number, use the class to the left.



1.10.9.3 The "Default" delta T entered in Mesorem Jr. is a +18 or "G" which is extremely stable but very overconservative in most cases. Therefore, if the Met Tower is unavailable and data can be obtained from the National Weather Service, a better stability class estimation can be used based on wind speed and time of day. Select the appropriate value from the table below and enter as "delta T" for Mesorem projections.

Alternative Delta "T" values for use with NWS Data

Wind Speed (mph)	Day (light)	Night (dim or dark)
<4	-1.6	+4
4-7	-1.4	+2
7-9	-1.4	+1
9-13	-1	-1
>13	-1	-1

References for above table are NUREG/CR-5247 (ORNL-6820) Vol.1, Rev. 2, "RASCAL Version 2.1 User's Guide", December 1994; and Turner, D.B. 1969, "Workbook of Atmospheric Dispersion Estimates". U.S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

1.10.9.4 Topography - Mesorem Jr. calculations include factoring in terrain elevation as the plume travels downwind. As the terrain heights vary smoothly within the 10 mile EPZ this is an un-noticed factor for the most part. At 306° to 309° however an initial rise to the Buckeye Hills begins at around the 8 - 10 mile distance. Because of this rise a plume modeled in that direction will show increased doses at 10 miles as compared to 5 miles, as the plume will be nearer to ground level at that distance. Because of this effect, be aware that dose will not always decrease with distance. Significant receptor sites should be looked at using the Receptor Display Menu or by using one of the Dynamic receptors (section 1.10.1).

1.10.9.5 Emergency Plan meter source check and calibration methodology.

- The Emergency Plan instruments are calibrated every 6 months by Cal Lab; source checked quarterly by the Cal Lab or RP Central; and checked for meter deflection with the button source to use.

- On removal of a meter from a kit for emergency use, the calibration sticker should indicate that calibration has been performed within the last 6 months. The white instrument response check record should indicate the full response check as being done within the last quarter. THE RESPONSE CHECK STICKER WILL NOT BE UPDATED EVERY MONTH AS ON THE UNIT METERS. DO NOT CHANGE THE STICKER as that will remove documentation of the full source check done.

- This methodology is used, as the sources to do the full required response check are not available at all of the Eplan Kits. Meters used in an actual event to determine protective dose rates will be taken to the Cal Lab after the event to have a followup source check done.

- The button source which is available in each kit is used to check for meter deflection on first use of the meter. A log entry indicating that sticker dates have been checked and deflection checks done should be made. A Tech should be assigned to do this initially on facility activation.

1.10.9.6 Definitions

- CDE - The Committed Dose Equivalent. In MESOREM, Jr. it is the dose equivalent to the thyroid that will be received from the inhalation of radioiodine in the plume by an adult during the 50-year period following the intake. In Mode B it includes particulates other than iodine.

- CEDE - The Committed Effective Dose Equivalent. In MESOREM, Jr. it is the sum of risk-weighted CDEs to the various organs or tissues of the body from the inhalation of radioiodine in the plume. In Mode B it includes particulates other than iodine.

- DDE - The Deep Dose Equivalent. This is an NRC term, required for 10CFR20 compliance in substitution for the internationally-accepted external EDE. DDE applies to external whole-body exposure, that is uniform irradiation from an external source, and is the dose equivalent at a tissue depth of 1 centimeter (1,000 mg/cm2).

- EDE - The Effective Dose Equivalent. In MESOREM, Jr., external EDE printouts are for external exposure due to plume immersion. Mode A PAR calculations also include external EDE from iodine deposition. Per NUMARC guidance, the external dose equivalent (which is directly measurable) is an appropriate substitute for external EDE and puts an upper bound on the 10CFR20 quantity "Deep Dose Equivalent" ("DDE").

- SDE - The Shallow Dose Equivalent. For the purposes of this paper it is the dose equivalent to the skin, from external exposure, at a tissue depth of 0.007 centimeters (a density-thickness of 7 milligrams per square centimeter).

- TEDE - The Total Effective Dose Equivalent, the sum of external EDE plus CEDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE in MESOREM Jr. is from immersion only.

- TODE - The Total Organ Dose Equivalent, the sum of external EDE plus thyroid CDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE component in MESOREM, Jr. is from immersion only. By NRC definition, TODE only applies to the organ receiving the highest dose; excluding particulate releases, for PVNGS' credible accidents this organ is the thyroid.

1.10.9.7 Shelter Dose - Shelter Doses are due to external exposure from plume immersion, committed internal dose from plume inhalation, and 96-hours of external exposure from that ground deposition which is projected for the projected plume duration; each of these components of dose increases with increased Release Duration. The 96-hour ground shine contribution is specified in EPA 400.

- The first results summary screens or pages of Mesorem Jr. output give external EDE rate in mRem/hour at Site Boundary and at 2-, 5-, and 10-miles; this is external EDE due to plume immersion only.

- The complete external EDE component (i.e., plume immersion and ground shine) of Shelter Dose TEDE and Shelter Dose TODE is calculated within Mesorem Jr. and is included in the PAR summary output of TEDE and TODE. The Site Boundary PAR output is automatic.

- Shelter Dose TEDE is calculated by multiplying the centerline Shelter Dose TEDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose TODE is calculated by multiplying the sum of the external EDE rate due to immersion and the thyroid CDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose thyroid CDE is calculated by multiplying the thyroid CDE rate for the specified receptor location by the release duration.

- No credit is taken in MESOREM, Jr. for shelter Dose Reduction Factors (DRFs of 1 are used); one may view shelter dose as the dose received by individuals in the plume center with no shelter.

1.10.9.8 Evacuation Dose - Evacuation Doses are due to external exposure from plume immersion and committed internal dose from plume inhalation. Ground deposition is not really involved, but is included in MESOREM, Jr. This is equivalent to the EPA 400 provision for use of "Combined Pathway" Dose Conversion Factors.

- The Plume Exposure Time is the Evacuation Time Estimate (2.9 hours for normal weather, 3.3 hours for adverse weather conditions) minus the Plume Arrival Time to the receptor site. Plume Exposure Time used in Evacuation Dose projections made via MESOREM, Jr. will not exceed the Evacuation Time Estimate (2.9 hours or 3.3 hours).
- The Plume Arrival Time is the sum of Plume Travel Time (upwind distance from receptor to release point, divided by wind speed) plus Time Until Release Begins (set equal to zero if release has begun). That is:
- Plume Exposure Time
- Evacuation Time - Plume Travel Time - Time Until Release Begins
- Both Plume Exposure Time and Evacuation Time begin at the time of the dose projection.
- This equation is not applicable to Shelter Dose projections; in Shelter Dose projections Plume Exposure Time is equal to Release Duration and has a user-specified value.)
- When the Evacuation Dose receptor location is already in the plume, Plume Travel Time will be zero, Time Until Release Begins will also be zero, and projected Plume Exposure Time will equal the Evacuation Time Estimate. Plume Exposure Time can be zero; MESOREM, Jr. will show <0.02 mrem Evacuation Doses for such locations, while still recommending evacuation when appropriate, even when Plume Exposure Time = zero at the Site Boundary.
- Evacuation Doses are determined by Plume Exposure Time:
- The TEDE Evacuation Dose is the 4-day external EDE from deposition plus the product of the TEDE rate multiplied by the Plume Exposure Time.
- The Thyroid CDE Evacuation Dose is simply the thyroid CDE rate multiplied by the Plume Exposure Time.
- The TODE Evacuation Dose is the 4-day external EDE from deposition plus the product of the sum of the thyroid CDE rate and the external EDE rate due to immersion multiplied by the Plume Exposure Time.

Appendix S - Abbreviations

1.0 ABBREVIATIONS

ACAD - Automatic Control Access Device
ADV - Atmospheric Dump Valve
AgX - Silver Zeolite
ALARA - As Low As Reasonably Achievable
AO - Auxiliary Operator
ARRA - Arizona Radiation Regulatory Agency
ASCII - American Standard Code for Information Interchange
CARS - Condenser Air Removal System
CAS - Central Alarm Station
CC - Cubic Centimeter
CDA - Core Damage Assessment
CDE - Committed Dose Equivalent
CET - Core Exit Thermocouple
CFR - Code of Federal Regulations
Ci - Curie
CRS - Control Room Supervisor
CSF - Critical Safety Function
CTMT - Containment
CW - Closed Window
DAC - Derived Air Concentration
DAT - Digital Audio Tape
DCF - Dose Conversion Factor
DDE - Deep Dose Equivalent
EAL - Emergency Action Level
EC - Emergency Coordinator
ECC - Energy Control Center
ECL - Emergency Classification Level
EDE - Effective Dose Equivalent
EDG - Emergency Diesel Generator
EOF - Emergency Operations Facility
EOP - Emergency Operating Procedure
ENS - Emergency Notification System
EPA - Environmental Protection Agency
ERDS - Emergency Response Data System
ERFDADS- Emergency Response Facility Data Acquisition and Display System
ESF - Emergency Safety Features
FBEVAS - Fuel Building Essential Ventilation Actuation Signal
FPB - Fission Product Barrier
FTS - Federal Telecommunications System
GE - General Emergency
GPD - Gallons Per Day
GPM - Gallons Per Minute

H2	-	Hydrogen
HDD	-	Hard Disk Drive
HECA	-	High Efficiency Charcoal Assembly
HEPA	-	High Efficiency Particulate Assembly
HPID	-	Health Physics IDentification
HPSI	-	High Pressure Safety Injection
I	-	Iodine
IC	-	Initiating Condition
KI	-	Potassium Iodide
LAN	-	Local Area Network
Lbm	-	Pounds Mass
LCO	-	Limiting Condition for Operation
LOAF	-	Loss Of All Feed
LOCA	-	Loss Of Coolant Accident
LPSI	-	Low Pressure Safety Injection
µCi	-	MicroCurie
MMI	-	Man-Machine Interface
MPH	-	Miles Per Hour
mRem	-	MilliRem
MS-DOS	-	MicroSoft Disk Operating System
MSSS	-	Main Steam Support Structure
MSSV	-	Main Steam Safety Valve
MST	-	Mountain Standard Time
MW	-	MegaWatt
NAN	-	Notification Alert Network
NG	-	Noble Gas
NPSH	-	Net Positive Suction Head
NRC	-	Nuclear Regulatory Commission
NUE	-	Notification of Unusual Event
NUMARC	-	Nuclear Management and Resource Council, Inc.
NWS	-	National Weather Service
OBE	-	Operating Basis Earthquake
OCS	-	Operations Computer Systems
ODCM	-	Offsite Dose Calculation Manual
OSC	-	Operations Support Center
OW	-	Open Window
PAG	-	Protective Action Guide
PAR	-	Protective Action Recommendation
PASP	-	Preplanned Accident Sampling Program
PBX	-	Private Branch eXchange
P/S	-	Primary to Secondary
PSIA	-	Pounds per Square Inch Absolute
PVNGS	-	Palo Verde Nuclear Generating Station
QSPDS	-	Qualified Safety Parameter Display System
R	-	Rem
RAS	-	Recirculation Actuation Signal
RASCAL	-	Radiological Assesment System for Consequence AnaLysis

RCP - Reactor Coolant Pump
RCS - Reactor Coolant System
RFAT - Radiological Field Assessment Team
RMS - Radiation Monitoring System
RO - Reactor Operator
RP - Radiation Protection
RPM - Radiation Protection Monitor
RPS - Reactor Protection System
RRACS - Radiological Records and Access Control System
RVLMS - Reactor Vessel Level Monitoring System
SAE - Site Area Emergency
SBCS - Steam Bypass Control System
SCF - Standard Cubic Feet
SG - Steam Generator
SGTR - Steam Generator Tube Rupture
SIAS - Safety Injection Actuation Signal
SID - Self-Indicating Dosimeter
SM - Shift Manager
SPDS - Safety Parameter Display System
SRO - Senior Reactor Operator
SSE - Safe Shutdown Earthquake
SSN - Social Security Number
STA - Shift Technical Advisor
STSC - Satellite Technical Support Center
TEDE - Total Effective Dose Equivalent
TLD - ThermoLuminiscent Dosimeter
TODE - Total Organ Dose Equivalent
TSC - Technical Support Center
UFSAR - Updated Final Safety Analysis Report
USNRC - United States Nuclear Regulatory Commission
WGDT - Waste Gas Decay Tank
XFMR - Transformer

9909280427

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-04	**022**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
EPIPS		00-000	WOLFE,W	X/STA-6050	PW	1	
EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
EPIPS		00-000	SMITH,D	X/STA-7294	PW	1	
EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
EPIPS		00-000	SONTAG, M	X/STA-7997	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 22	ST

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x6131 m.s. 7720

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Procedure Number	Revision #	Effective Date
EPIP-04	**022**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	SPENCER,B	Y/MARICOPA CNTY DEPT OF EMERG MGMT 2035 N 52ND ST PHX AZ 85008	PW	1	
EPIPS		00-000	PORTER,J CAPTAIN	Y/MARICOPA CO SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	

Remarks
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PW 14	ST

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x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-04	**022**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-025		B/UII-CR	PW	1	
EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
EPIPS		15-002	CAS	D/SEC-BLDG	PW	1	
EPIPS		15-003	SAS	D/SEC	PW	1	

Remarks
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PW 17	ST

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-04	**022**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		17-001		C/ANX-DW-EOF-LIB	PW	1	
EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

Remarks
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For Questions Contact NIRM

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EMERGENCY OPERATIONS FACILITY ACTIONS	EPIP-04	Revision 22

PROCEDURE INTENT

This procedure provides functional instruction for the activation and operation of the Emergency Operations Facility

rev	description
22	This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16DP-0EP13	Emergency Classification
16DP-0EP14	Satellite Technical Support Center Actions
16DP-0EP17	Emergency Operations Facility Actions
16TD-0EP012	Assembly
16TD-0EP031	Core Damage Assessment
16TD-0EP041	Dose Projection
16TD-0EP051	Emergency Exposures and KI
16TD-0EP054	Emergency Response Data System
16TD-0EP056	ERFDADS Application
16TD-0EP161	Protective Actions
16TD-0EP191	Site Evacuation
Unnumbered	Dose Projection Basis Document
Unnumbered	Emergency Action Levels Basis Document

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1.0 OBJECTIVE

This procedure provides functional instruction for the activation and operation of the Emergency Operations Facility (EOF). It should be referenced anytime the EOF has been activated. It should also be referenced by other Emergency Response personnel when responding to that facility during any classified emergency event.

2.0 LIMITATIONS AND PRECAUTIONS

2.1 If the EOF becomes uninhabitable, the APS Buckeye Office may be selected as a backup by the Emergency Operations Director. The Radiological Assessment Coordinator will aid in evaluating and formulating recommendations for relocation.

2.2 Notifications to State/County agencies using the Palo Verde NAN Emergency Message Form shall commence within 15 minutes following each initial, upgraded, or downgraded emergency declaration or any change to a Protective Action Recommendation. Notifications to State/County agencies per the Emergency Termination Message Form shall commence within 15 minutes following termination of the emergency declaration.

2.3 The NRC shall be contacted immediately following notification of State/County agencies and within 60 minutes following initial, upgraded, or downgraded emergency declarations. The NRC shall be contacted immediately following notification of State/County agencies for emergency declaration termination.

2.4 Assembly is recommended at the Alert classification level unless the Emergency Coordinator is reasonably assured that the condition does not have the potential to further degrade. Accountability is required for a Site Area Emergency or a General Emergency and must be completed within 30 minutes following the request for Accountability. Accountability does not have to be performed immediately following the request for Assembly.

2.5 Although Site Evacuation is optional at the Site Area Emergency classification level, it is required at the General Emergency level.

2.6 A currently licensed Senior Reactor Operator must approve any suspension of safeguards directed by the Emergency Coordinator prior to taking the action.

2.7 In the event of a declaration of General Emergency, the response by the State of Arizona may involve actions to evacuate the public to include citizens out to ten miles in the Emergency Planning Zone. Note that the state's Protective Action Decision may differ from the site's Protective Action Recommendation.

2.8 The following non-delegable duties are assumed by the Emergency Operations Director upon classification of an emergency event:

- notification of offsite emergency response agencies and organizations
- provision of Protective Action Recommendations to offsite emergency management agencies

3.0 EMERGENCY OPERATIONS DIRECTOR ACTIONS

3.1 Initial Actions

3.1.1 If, at any time during the event, relocation of facility staff to the Backup Emergency Operations Facility is indicated, direct the Administrative and Logistics Coordinator to form provisions for relocation of facility operations to the Backup Emergency Operations Facility.

3.1.2 Contact the Onsite Emergency Coordinator at the Technical Support Center and review the following items:

- Basis for the current emergency classification
- Current plant status
- Corrective action implementation

3.1.3 Record the time and activate the Emergency Operations Facility when the following required facility personnel have arrived:

- Technical Analysis Manager
- Security Coordinator
- Government Liaison
- Radiological Assessment Coordinator*
- Dose Assessment Health Physicist*

* A qualified RAC who is also qualified as an DAHP may choose to assume both functions for facility activation purposes.

Record EOF activation time: ____________________

3.1.4 When facility emergency response personnel have assumed their duties and responsibilities, notify the Emergency Coordinator, the Senior Vice President - Nuclear, and the Arizona Division of Emergency Management - Technical Operations Center of the following items:

- The Emergency Operations Facility has been activated
- Current emergency classification / plant status
- Recommended protective actions

3.1.5 Direct the Government Liaison to prepare follow-up emergency information in anticipation of Arizona Radiation Regulatory Agency request. Form EP-0542, Followup Emergency Message (see Appendix C) may be used as guidance.

3.2 Subsequent Actions

3.2.1 For changes in emergency classification, direct the Government Liaison to notify offsite agencies within 15 minutes of the change in classification.

3.2.2 For changes in the Protective Action Recommendation, direct the Government Liaison to notify offsite agencies within 15 minutes of the change in Protective Action Recommendation.

3.2.3 Periodically review plant status, emergency classification, and corrective actions with the Emergency Coordinator.

3.2.4 If a site evacuation has been ordered, assist the Emergency Coordinator with activities supporting the site evacuation.

3.2.5 If administrative procedures do not support current activities, take exceptions, as necessary, to QA/QC and plant administrative procedures.

3.2.6 If additional administrative support or resources are needed, authorize the Administrative and Logistics Coordinator to provide support and resources, as necessary.

3.2.7 Brief offsite agency personnel periodically, as necessary, on plant status, emergency classification, and corrective actions taken.

3.2.8 Conduct periodic Emergency Operations Facility briefings based on plant conditions / other problems.

3.2.9 If offsite assistance is needed, advise the Administrative and Logistics Coordinator to call the required organizations as needed. Request the Security Coordinator to arrange for access when assistance arrives.

3.2.10 Review and approve draft information for the JENC compiled by the Information Coordinator as necessary.

3.2.11 Assist the Emergency Coordinator with activities supporting implementation of the Severe Accident Management Guidelines.

3.3 Terminal Actions

3.3.1 Perform the following actions for event termination or downgrade.

3.3.1.1 Address the following items with the Emergency Coordinator:

1. The anticipated plant response is such that there should be no challenge to any fission product barriers or radiation releases in excess of Technical Specifications.

2. Present plant conditions offer no possibility of an adverse impact on the health and safety of the public and plant personnel.

3. Measures have been successfully instituted to correct or compensate for malfunctioning equipment.

3.3.1.2 Consult with USNRC representatives in the Emergency Operations Facility (if present), personnel at the State Technical Operations Center, and personnel with the Arizona Radiation Regulatory Agency prior to emergency event downgrade or termination.

3.3.1.3 Direct all coordination for the release of information through the State Emergency Operations Center / Technical Operations Center so that Protective Action Recommendations can be considered.

3.3.1.4 Do not inform the JENC of event downgrading or termination.

3.3.1.5 Upon emergency event termination, direct the Government Liaison to notify offsite agencies within 15 minutes of event termination and to notify PVNGS Emergency Response Organization personnel.

3.3.1.6 If appropriate, establish the Recovery Organization in accordance with Appendix P.

3.3.2 When the event is terminated, collect all EOF personnel documentation and logs and forward associated paperwork to the Emergency Planning Department.

4.0 ADMINISTRATIVE AND LOGISTICS COORDINATOR ACTIONS

4.1 Initial Actions

4.1.1 When duties have been assumed and an informational briefing has been received, ensure that the facility ERFDADS terminals are functioning properly and that all communications equipment is operational. As necessary, refer to Appendix O, ERFDADS Operation, for guidance.

4.1.2 Brief the Security Coordinator on required facility security measures and Administrative Support personnel on necessary job duties.

4.1.3 Synchronize all clocks in the facility with that of the Affected Unit.

4.2 Subsequent Actions

4.2.1 If directed, at any time during the event, to form provisions for relocation of facility staff, relocate selected positions and facility operations to the Backup Emergency Operations Facility. EPIP-05, Backup Emergency Operations Facility, may be referenced for further guidance.

4.2.2 Contact the Operations Advisor in the Satellite Technical Support Center, the Security Director in the Technical Support Center, and the Operations Support Center Coordinator in the Operations Support Center and request each to perform the following:

- provide a summary of staffing requirements / rotation schedule for their facilities to you as time permits
- ensure personnel in their facilities will not exceed overtime limitations per Technical Specifications

4.2.3 Request that Costs and Budgets personnel establish a Work Breakdown Structure (WBS) Number for event / insurance tracking purposes.

4.2.4 As directed, contact offsite support organizations to obtain the necessary technical and/or additional personnel support.

4.2.5 When the Operations Advisor in the Satellite Technical Support Center, the Security Director in the Technical Support Center, and the Operations Support Center Coordinator in the Operations Support Center have each provided shift staffing requirements for their facility, record Personnel Shift Staffing for all onsite facilities and submit to the Emergency Operations Director. Form EP-0011, Personnel Shift Staffing (see Appendix C) may be used as guidance.

4.2.6 If necessary, contact Fire Protection personnel to obtain additional respiratory protection equipment from inventories maintained by Fire Protection.

4.2.7 If directed, contact additional Emergency Response Organization support personnel for duty, ensuring that 10 CFR 26.20(e) FFD requirements are maintained. Form EP-0013, Duty Contact Register (see Appendix C) may be used for guidance.

4.2.8 As required, maintain support in the following areas for the onsite facilities:

- administrative support
- technical documentation / manuals
- communications equipment
- analytical equipment
- additional personnel
- transportation
- housing / food (staff support)

4.3 Terminal Actions

4.3.1 Collect all documentation and associated logs from the Security Coordinator and Administrative Support personnel at event termination.

4.3.2 Submit logs, data, and other documentation to the Emergency Operations Director after event termination.

5.0 ADMINISTRATIVE SUPPORT ACTIONS

5.1 Initial Actions

5.1.1 Consult with the Administrative and Logistics Coordinator to determine and initiate immediate support functions required to aid activation of the facility.

5.2 Subsequent Actions

5.2.1 Render assistance and support for various duties as assigned.

5.3 Terminal Actions

5.3.1 Submit logs, data, and other documentation to the Administrative and Logistics Coordinator after event termination.

6.0 ASSISTANT EMERGENCY OPERATIONS DIRECTOR ACTIONS

6.1 Initial Actions

6.1.1 Consult with the Emergency Operations Director and assist with support functions required to aid activation of the facility.

6.2 Subsequent Actions

6.2.1 Render assistance and support for various duties as assigned.

6.3 Terminal Actions

6.3.1 Submit logs, data, and other documentation to the Emergency Operations Director after event termination.

7.0 DOSE ASSESSMENT HEALTH PHYSICIST ACTIONS

7.1 Initial Actions

7.1.1 Contact the Radiation Protection Monitor (if the RAC has not already done so) and obtain a detailed briefing on completed dose projections, PARs issued by the RPM, and related issues. When satisfied, formally assume dose projection responsibilities. **The relief of the RPM should be done as soon as practical; and may be done well in advance of the formal EOF activation.**

7.1.2 Access ERFDADS and determine the status of current meteorological conditions and available plant data. If Met data is unavailable take the appropriate alternative actions per the guidance in Appendix F, Dose Projection.

7.1.3 Contact the Radiological Monitoring Technician and request a briefing on current RMS conditions, limitations and Tech Spec implications. Request an update on significant changes.

7.1.4 Review current dose projections and Protective Action Recommendations issued by PVNGS for accuracy and applicability to current conditions.

7.1.5 Consult with the Technical Analysis Manager to determine the most probable effluent release pathways and release duration.

NOTE

If dose projections can no longer be performed in the EOF, e.g., if the EOF is being evacuated to the Backup EOF, dose projection duties may be transferred back to the RP Monitor in the STSC.

7.2 Subsequent Actions

7.2.1 If conditions have changed or "bounding" parameters have been requested, perform dose projections, with emphasis placed on source term, meteorological data, and radiological field assessment data.

7.2.2 Recommend Protective Action Recommendations (PARs) to the Radiological Assessment Coordinator in accordance with Appendix B, Protective Action Recommendations.

7.3 Terminal Actions

7.3.1 Submit logs, data, and other documentation to the Radiological Assessment Coordinator after event termination.

8.0 GOVERNMENT LIAISON ACTIONS

8.1 Initial Actions

8.1.1 When duties have been assumed and an informational briefing has been received, establish contact with the Satellite Technical Support Center Communicator in the Affected Unit, relieve that individual of duties and responsibilities, and request a transmitted copy of the current Palo Verde NAN Emergency Message.

NOTE

Notifications of downgrade to an emergency classification or protective actions recommended to state authorities by PVNGS shall not be transmitted to the Joint Emergency News Center.

8.1.2 If requested by the Emergency Operations Director, contact the following agencies and inform them of Emergency Operations Facility activation:

- Joint Emergency News Center (JENC Technical Advisor)
- State Technical Operations Center (Offsite Technical Representative)

8.2 Subsequent Actions

8.2.1 Notify the following agencies of radioactive plume travel direction / speed:

- Federal Aviation Administration
- National Transportation Safety Board

8.2.2 Notify the Institute of Nuclear Power Operations (INPO) of the emergency.

8.2.3 Notify offsite agencies within 15 minutes of any change in emergency classification or event termination.

8.2.4 If directed, collect information for a follow-up emergency message.

8.2.5 If plant information is requested by Joint Emergency News Center or State Technical Operations Center staff, provide information only to the JENC Technical Advisor, the JENC Facility Coordinator, or State Technical Operations Center staff members.

8.2.6 Provide briefing assistance for government staff at the EOF to the Technical Analysis Manager as necessary.

8.3 Terminal Actions

8.3.1 Submit logs, data, and other documentation to the Technical Analysis Manager after event termination.

9.0 INFORMATION COORDINATOR ACTIONS

9.1 Initial Actions

9.1.1 When duties have been assumed and an informational briefing has been received, establish communications with the Joint Emergency News Center Technical Advisor or Facility Coordinator.

NOTE

Notifications of downgrade to an emergency classification or protective actions recommended to state authorities by PVNGS shall not be transmitted to the Joint Emergency News Center.

9.2 Subsequent Actions

9.2.1 Gather appropriate information and draft materials. (Ensure accurate emergency classification dates and times are retrieved from Block 3 of Form EP-0541, Palo Verde NAN Emergency Message Form.

9.2.2 Unless relieved by corporate financial personnel, notify American Nuclear Insurers of the emergency and advise with updates as the need arises.

9.2.3 Prepare draft information for approval by the Emergency Operations Director and transmit the approved draft information to the Joint Emergency News Center.

9.3 Terminal Actions

9.3.1 Submit logs, data, and other documentation to the Emergency Operations Director after event termination.

10.0 PLANT STATUS TECHNICIAN ACTIONS

10.1 Initial Actions

10.1.1 When duties have been assumed and an informational briefing has been received, establish communications monitoring capability with the Unaffected Shift Technical Advisor in the Satellite Technical Support Center / Control Room and the Plant Status Technician in the Technical Support Center.

10.1.2 Record an initial set of current plant data on the facility plant status boards using the approved color code scheme.

10.2 Subsequent Actions

10.2.1 Maintaining open communications capability previously established, record accurate, current plant data on the facility plant status boards on a continuing basis using the approved color code scheme.

10.3 Terminal Actions

10.3.1 Submit logs, data, and other documentation to the Technical Analysis Manager after event termination.

11.0 RADIATION PROTECTION SUPPORT TECHNICIAN ACTIONS

11.1 Initial Actions

11.1.1 When duties have been assumed and an informational briefing has been received, place the Emergency Operations Facility Radiation Monitoring System monitor RU-13B into operation in the Emergency Mode in accordance with the posted monitor instructions. See the map at the end of this section for equipment locations.

11.1.2 Remove the Area Radiation Monitor from the emergency locker and place it into operation in the Emergency Operations Facility.

11.2 Subsequent Actions

11.2.1 Establish a contamination control point at the Emergency Operations Facility Stairway #1 airlock entrance as required.

11.2.2 If habitability surveys are needed, perform the following actions:

11.2.2.1 Place a thermoluminiscent dosimeter in each facility airlock.

11.2.2.2 Periodically ensure no upscale trends exist on RU-13B for gaseous, particulate, and Iodine activity.

11.2.2.3 Perform facility air sampling in accordance with 75RP-9RP07, Radiation Surveys. <10 cubic feet air samples may be taken for ALARA considerations. Form EP-0481, Air Sample Data (see Appendix C) may be used for calculations

11.2.3 Maintain dosimetry requirements as per the RAC's direction.

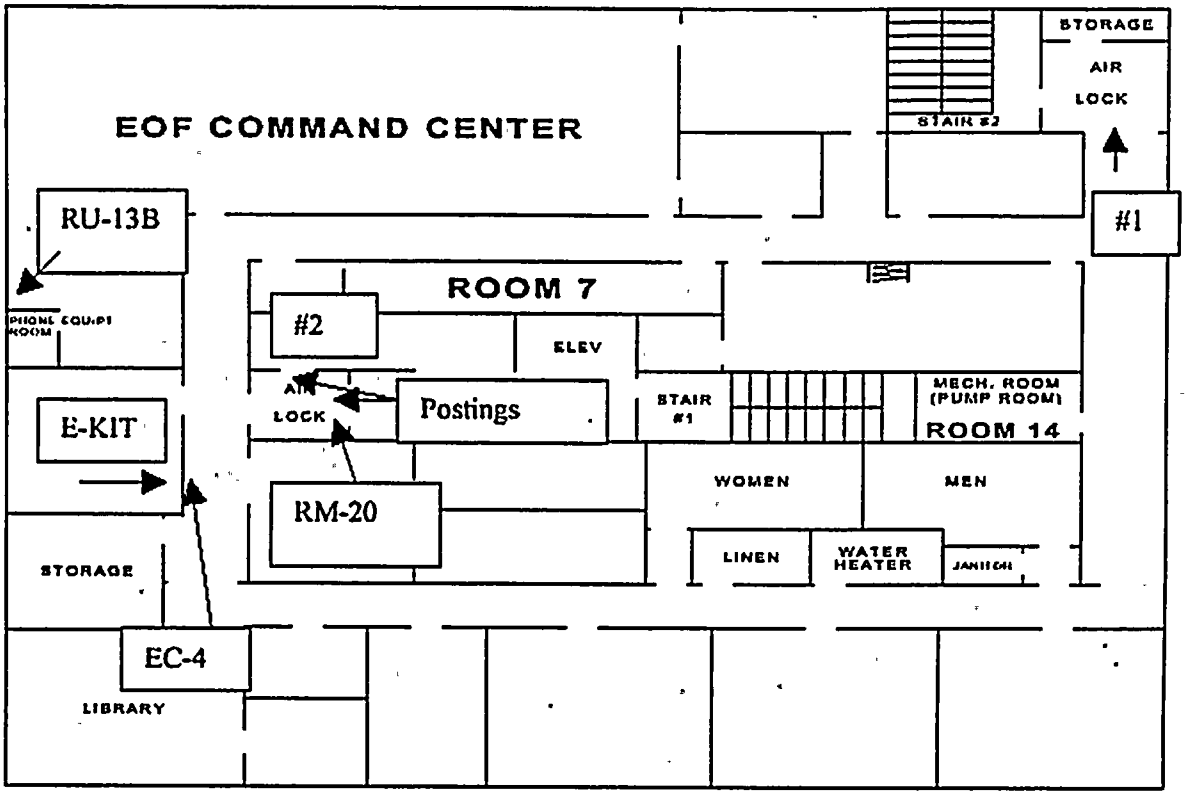
11.2.4 If EOF RMS Monitor RU-13B alarms, investigate and resolve annunciator alarms and evaluate the impact on facility filtration.

11.2.5 Assist the Radiological Assessment Coordinator with administrative functions.

11.3 Terminal Actions

11.3.1 Place the Emergency Operations Facility Radiation Monitoring System monitor RU-13B into operation in the Normal Mode in accordance with the posted monitor instructions.

11.3.2 Submit logs, data, and other documentation to the Radiological Assessment Coordinator after event termination.



All postings are premade, and support clips are glued to walls #1 and #2.

- Post back stairs "No Entry/No Exit" at #1
- Post Elevator area and set up frisker at #2
- Set up EC-4 in hall outside storage room.
- For assistance with RU-13, call Unit RM Tech or have Logistics Coord. contact I&C.
- Post TLD in #1 and #2 as required.

12.0 RADIOLOGICAL ASSESSMENT COMMUNICATOR ACTIONS

12.1 Initial Actions

12.1.1 When duties have been assumed and an informational briefing has been received, determine and report the operability status of the following communications circuits to the Radiological Assessment Coordinator and the Administrative and Logistics Coordinator:

- normal telephone systems
- dedicated voice systems
- Environmental Assessment Line
- Base station radio

12.1.2 Establish communications capabilities with radiological assessment personnel in the Technical Support Center and the Affected Unit Satellite Technical Support Center using the normal telephone system.

12.2 Subsequent Actions

12.2.1 Direct the RFAT teams as requested and coordinate team movement with offsite agency teams. Consideration should be given for the following:

- 2 teams at the Site Boundary - 1 at each plume edge
- 1 team at the leading edge of the plume
- Teams alternated for plume centerline sampling (ALARA)

12.2.2 Plot reported dose rates and team locations to aid in plume tracking.

12.2.3 Maintain communications logs regarding radiological assessment.

12.2.4 Initiate a tracking mechanism of EDE / TEDE ratios for individual team member exposures and notify the RAC is it becomes prudent to consider implementation of Potassium Iodide (KI) administration.

12.2.5 Inform the Radiological Assessment Coordinator of changes in radiological status that could change Protective Action Recommendations (see Appendix B - Protective Action Recommendations) or emergency classification (see Appendix A - Emergency Action Levels).

12.3 Terminal Actions

12.3.1 Submit logs, data, and other documentation to the Radiological Assessment Coordinator after event termination.

13.0 RADIOLOGICAL ASSESSMENT COORDINATOR ACTIONS

13.1 Initial Actions

13.1.1 Contact the Radiation Protection Monitor in the Satellite Technical Support Center and determine dose projections, Protective Action Recommendations made thus far, status / location of offsite survey teams dispatched and extent and consequences of radiological releases / plant conditions.

13.1.2 Relieve the Radiation Protection Monitor in the Satellite Technical Support Center of responsibilities for Off-Site Teams and Dose Assessment. **The relief of the RPM should be done as soon as practical; and may be done well in advance of the formal EOF activation.**

13.1.3 When duties have been assumed and an informational briefing has been received, ensure that the following personnel are fully briefed:

- USNRC Liaison, Health Physics
- Radiological Assessment Communicator
- Radiation Protection Support Technician
- Dose Assessment Health Physicist*

* A qualifed RAC who is also qualifed as an DAHP may choose to assume both functions for facility activation purposes.

13.1.4 Contact the Radiological Protection Coordinator in the Technical Support Center and review known conditions, release points, etc. Periodically update the RPC as conditions change.

13.2 Subsequent Actions

13.2.1 Establish contigency plans to obtain alternate data if ERFDADS / Radiation Monitoring System/Met Data or dose assessment software is unavailable.

13.2.2 If airborne activity or plume travel are such that the EOF may be impacted, direct that a facility contamination control point is properly established and that local area thermoluminescent dosimetry has been placed in each facility airlock.

13.2.3 Review Dose Projections and field team data and determine if a change in Protective Action Recommendation (see Appendix B - Protective Action Recommendations) or emergency classification (see Appendix A - Emergency Action Levels) is required. Discuss necessary changes with the EOD. Form EP-0381, Dose Projected PAR (see Appendix C - Forms) may be used to assist.

13.2.4 If EOF habitability is impacted, advise the Emergency Operations Director of the need to relocate Emergency Operations Facility personnel to a backup facility.

13.2.5 If the EOD has directed EOF relocation, perform the following actions:

13.2.5.1 Evaluate the necessity to go to the Buckeye Airport to decontaminate EOF staff prior to relocating to the Backup EOF.

13.2.5.2 Notify radiological staff members to go to the Backup EOF or another facility based on the event.

13.2.5.3 Contact the Radiation Protection Monitor and assign the RPM the responsibility for performance of dose projection and control of offsite survey teams.

13.2.5.4 Upon arrival at a backup facility, relieve the RPM of the responsibilities previously assigned.

13.2.6 Determine personnel traffic areas, entry and exit routes, and personnel radiological protection requirements outside the Protected Area.

13.2.7 Take actions for Site Evacuation in accordance with Appendix J, Site Evacuation.

13.2.8 If the Radiological Assessment Communicator requests input on survey team location, evaluate meteorological data, plant radiological release points, and dose projection data. Provide direction for survey teams and issue EDE / TEDE SID limits if required. The Dose Projection Technical Bases may be used for guidance.

13.2.9 If state survey data has been transmitted to the EOF, ensure that the Radiological Assessment Communicator receives the state survey team data.

13.2.10 If Assembly has been directed by the Emergency Coordinator, evaluate Assembly Areas outside the Protected Area for potential of radiological hazards and dispatch survey teams, if required.

13.3 Terminal Actions

13.3.1 Ensure that dose rate meters from the emergency kit are transmitted to the calibration facility for calibration and required maintenance after event termination.

13.3.2 If implementation of a recovery effort is appropriate after event termination, consult with the Emergency Operations Director regarding Radiation Protection support.

13.3.3 Collect all documentation and associated logs from the following support personnel:

- Dose Assessment Health Physicist
- Radiation Protection Support Technician
- Radiological Assessment Communicator
- USNRC Liaison Health Physics

13.3.4 Submit logs, data, and other documentation to the Emergency Operations Director after event termination.

14.0 SECURITY COORDINATOR ACTIONS

14.1 Noteworthy Items

14.1.1 Ventilation for the EOF is maintained in the "Filtration Mode" of operation, which is the normal lineup, to ensure that the facility remains habitable. This mode maintains the facility under a positive pressure with respect to the outside environment and filters the air supply. Use of this document assumes that no maintenance is currently being performed on the facility ventilation system and that the system is in the proper mode of operation. Facility habitability for the EOF is maintained by closing the airlock doors and verifying positive pressure in the EOF.

14.2 Initial Actions

14.2.1 Post the appropriate signs at the EOF access points. Ensure that all EOF airlock doors are closed to maintain facility habitability. Lock the inner airlock door (door E-A18) at Stairway #2.

<u>NOTE</u>

Ventilation for the EOF is not to be taken out of the "Filtration Mode" except when inspections or maintenance must be performed.

14.2.2 Verify proper EOF emergency ventilation system operation by conducting the following steps at the Magnehelic Gauges located next to the RMU-13 panel:

14.2.2.1 Verify that each valve is in the open position.

14.2.2.2 Verify the EOF to Outside guage reads greater than or equal to 0.1.

14.2.2.3 Verify the EOF to First Floor guage reads greater than or equal to 0.1.

14.2.3 After verification of emergency ventilation system operation, complete the appropriate action:

14.2.3.1 If <u>no abnormalities</u> were noted, inform the Administrative & Logistics Coordinator that the status of the emergency ventilation has been verified.

14.2.3.2 If <u>any abnormalities</u> were noted, inform the Administrative & Logistics Coordinator that the status could not be verified and that HVAC Maintenance Engineers must be notified.

14.2.3.3 If differential pressure is less than 0.1, inform the EOD for determination on continued habitability. Notify the Administrative & Logistics Coordinator and Security Director of the decision.

14.2.4 If the decision is made to relocate to the backup EOF, retrieve a portable radio from the EOF Storage Room. Contact CAS and direct them to re-program the radio to the Security talk group channel configuration.

14.2.5 When duties have been assumed and an informational briefing has been received, contact the Security Director and complete the following:

14.2.5.1 Determine the current site access restrictions if any.

14.2.5.2 Notify the Security Headquarters Team Leader of any individuals who will require access to the site.

14.2.5.3 Inform the Administrative & Logistics Coordinator of any required actions.

14.3 Subsequent Actions

14.3.1 Ensure that 10 CFR 26.20(e) FFD requirements have been maintained. Form EP-0013, Duty Contact Register (see Appendix C) may be used for guidance.

14.3.2 If the Emergency Coordinator has directed a site evacuation, take the following actions:

14.3.2.1 Advise the Emergency Operations Director.

14.3.2.2 Advise the Radiological Assessment Coordinator (RAC) of the evacuation directive and request radiological monitoring team support.

14.3.2.3 With recommendations from the RAC, assign personnel as Reassembly Team Leaders and brief them on acceptable evacuation route(s) to use and on the Reassembly Area. See EPIP-06, Reassembly Area Actions for guidance.

14.3.2.4 Contact the Water Reclamation Facility Shift Supervisor and direct the distribution of emergency van keys, if necessary.

14.3.2.5 Contact local law enforcement agencies and advise them of the site evacuation and request assistance with traffic control, if required.

14.4 Terminal Actions

14.4.1 Submit logs, data, and other documentation to the Administrative and Logistics Coordinator after event termination.

15.0 SHIFT TECHNICAL ADVISOR ACTIONS

15.1 Initial Actions

15.1.1 When duties have been assumed and an informational briefing has been received, access ERFDADS and assess the status of plant systems and critical plant parameters.

15.2 Subsequent Actions

15.2.1 Contact technical support personnel as directed.

15.2.2 Maintain communications with technical support personnel and with the Shift Technical Advisor in the Technical Support Center regarding technical status, proposed recommendations, and corrective actions.

15.2.3 Advise the Plant Status Technician of any significant changes to plant status and the Technical Analysis Manager of proposed recommendations and any significant changes to plant status.

15.2.4 Operate the EOF diesel generator in accordance with instructions in Appendix N, EOF Diesel Generator Operations.

15.3 Terminal Actions

15.3.1 Submit logs, data, and other documentation to the Technical Analysis Manager after event termination.

16.0 SYSTEMS ENGINEERING ACTIONS

16.1 Initial Actions

16.1.1 When duties have been assumed and an informational briefing has been received, contact the Engineering Section in the Technical Support Center for analyses requirements.

16.1.2 Access ERFDADS and ensure an accurate baseline data set is conveyed appropriately to the Plant Status Technician.

16.2 Subsequent Actions

16.2.1 Maintain ERFDADS data analyses and ensure critical data is relayed to the Plant Status Technician as required.

16.2.2 Provide recommendations to the Technical Analysis Manager as required.

16.3 Terminal Actions

16.3.1 Submit logs, data, and other documentation to the Technical Analysis Manager after event termination.

17.0 TECHNICAL ANALYSIS MANAGER ACTIONS

17.1 Initial Actions

17.1.1 When duties have been assumed and an informational briefing has been received, provide a status briefing to the following personnel:

- Government Liaison
- Plant Status Technician
- Shift Technical Advisor
- Systems Engineering

17.1.2 Contact the Technical Engineering Manager in the Technical Support Center and request an assessment of plant conditions.

17.1.3 Determine the need for and contact any additional engineering and technical support personnel as required.

17.2 Subsequent Actions

17.2.1 Coordinate with Engineering personnel and, based on an assessment of plant conditions, evaluate the projected occurrences and their corrective actions, noting the following considerations:

- recommended strategy to reduce or eliminate the effects of the projected occurrence
- recommended strategy to reduce or eliminate source terms and the subsequent offsite release (requires Radiological Assessment Coordinator consultation)
- functional status of plant safety systems

17.2.2 Consult with the Technical Engineering Manager in the Technical Support Center to determine any technical changes in plant conditions which may have occurred, recommendations, and the need to modify the current Engineering evaluations, if necessary.

17.2.3 With assistance from the Government Liaison, maintain offsite agency representatives stationed in the facility advised of current Engineering evaluations and contingencies.

17.2.4 As necessary, continue with assessment, analyses, and evaluations of projected occurrences and their corrective actions.

17.2.5 Maintain the Dose Assessment Health Physicist advised of changing plant conditions which may affect the magnitude or duration of any potential radiological release.

17.2.6 Maintain the Plant Status Technician advised of any technical change in plant conditions which may affect the accuracy of plant status board data.

17.2.7 Verify the accuracy and adequacy of any technical information prior to its release for public dissemination by the Information Coordinator.

17.2.8 Consult with the Technical Engineering Manager in the Technical Support Center and the Emergency Operations Director regarding current plant status and recommendations for additional resources required for plant stabilization and recovery.

17.3 Terminal Actions

17.3.1 Collect all documentation and associated logs from the following support personnel:

- Government Liaison
- Plant Status Technician
- Shift Technical Advisor
- Systems Engineering

17.3.2 Submit logs, data, and other documentation to the Emergency Operations Director after event termination.

18.0 USNRC LIAISON HEALTH PHYSICS ACTIONS

18.1 Initial Actions

18.1.1 When duties have been assumed and an informational briefing has been received, contact the USNRC using the Health Physics Network telephone.

18.1.2 When contact with the USNRC has been established, identify yourself as the HPN Communicator at Palo Verde and request connection to the HPN Teleconference Bridge.

18.1.3 When connection to the HPN Teleconference Bridge has been established, provide the initial radiological conditions for the event.

18.2 Subsequent Actions

18.2.1 Maintain continuous communications with the USNRC until relieved by a representative of the USNRC Emergency Response Team.

18.3 Terminal Actions

18.3.1 Submit logs, data, and other documentation to the Radiological Assessment Coordinator after event termination.

Appendix A - Emergency Action Levels

1.0 Precautions and limitations

1.1 The Emergency Action Levels in this section each incorporate an Emergency Action Level Identification Code (i.e., nn-nn) immediately following the Emergency Action Level statement. This code functions as a cross-reference to the PVNGS Emergency Action Level Technical Bases in Appendix Q - EAL Technical Bases. The first number corresponds to the EAL table number in this section. The second number corresponds to the sequential EAL within that table. The identification code number is also employed as data on PVNGS Emergency Message Forms.

1.2 Each entry in this section incorporates the industry generic Initiating Condition (IC) and the plant specific Emergency Action Level. The Initiating Condition should be reviewed to ensure the significance addressed by the Emergency Action Level is taken into consideration.

1.3 The plant operating Mode that existed at the time the event occurred, prior to any protective system or operator action initiated in response to the condition, is the applicable Mode of the Emergency Action Levels. If an event occurs, and a lower or higher plant operating Mode is reached before the emergency classification can be made, the declaration shall be based on the Mode that existed at the time the event occurred.

1.4 If a conflict exists in the classification level due to an Emergency Action Level discrepancy, the Emergency Action Level most accurately describing the condition should be applied when classifying the event.

1.5 If an indication of barrier challenge or failure exists which is inconsistent with the current emergency classification, rediagnose plant conditions and implement the emergency classification indicated.

1.6 If a more severe Fission Product Barrier "LOSS" Category in Section 3 has been met, then assume the "POTENTIAL LOSS" criteria of the associated category has been automatically satisfied.

1.7 Used in the context of a steam generator tube rupture as stated in the Fission Product Barrier Emergency Action Level [1-7], a "prolonged release of contaminated secondary coolant" encompasses a main steam line break, feedwater line break, stuck open steam generator safety and/or atmospheric dump valve(s), and plant cooldown (i.e., to Mode 5) while steaming the affected steam generator to atmosphere.

2.0 Instructions

2.1 Evaluate the following tables and determine the most accurate Emergency Action Level which is currently being met or exceeded.

Table 1: Fission Product Barrier Reference (Modes 1-4)

FUEL CLAD BARRIER		RCS BARRIER		CONTAINMENT BARRIER	
POTENTIAL LOSS	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**
Highest valid CET temperature > 700°F [1-1] RVLMS level < 21% plenum [1-2]	Highest valid CET temperature > 1200°F [1-1] RCS activity > 300 µCi/gm Dose Equivalent I-131 [1-3] CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr, or RU-149 > 1.8E+06 mrem/hr [1-4]	RCS leak > 44 gpm [1-6] SGTR > 44 gpm [1-7] LOAF such that minimum acceptable feedwater flow cannot be maintained [1-8]	RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling, i.e., RCS at saturation conditions [1-6] SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1) [1-7]	CTMT pressure 50 psig and increasing [1-10] CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating [1-10] CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr, or RU-149 > 8.7E+09 mrem/hr [1-11] H2 concentration > 3.5% by volume [1-10] CET > 1200°F and not restored w/i 15 min. or CET > 700°F with RVLMS < 21% plenum and not restored within 15 min. [1-12]	Rapid unexplained CTMT pressure decrease following initial increase [1-10] CTMT pressure or sump level response not consistent with LOCA conditions [1-10] Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists [1-13] Release of contam. Secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage [1-14]
Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier [1-5]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier [1-9]		Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier [1-15]	

APPLY THE CRITERIA ABOVE TO THE CONDITIONS BELOW	
UNUSUAL EVENT (NUE)	Any loss OR any potential loss of Containment
ALERT	Any loss OR any potential loss of either Fuel Clad or RCS
SITE AREA EMERGENCY (SAE)	Loss of both Fuel Clad and RCS OR potential loss of both Fuel Clad and RCS OR potential loss of either Fuel Clad or RCS AND loss of any additional barrier
GENERAL EMERGENCY (GE)	Loss of any two barriers AND potential loss of a third barrier

Table 2: Electrical Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Loss of All Offsite Power to Essential Buses for > 15 Minutes Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses [2-1]	**IC - AC Power Capability to Essential Buses Reduced to a Single Power Source for > 15 Minutes Such That Any Additional Single Failure Would Result in Station Blackout** Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition: Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG) OR Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR) [2-3]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4 [2-5]	**IC - Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4 AND Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated [2-7]
IC - Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for > 15 Minutes Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled [2-2]	**IC - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Buses During Cold Shutdown or Refueling Mode** Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled [2-4]	**IC - Loss of All Vital DC Power** Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4 [2-6]	

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-1]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-8]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-14]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** • Per 74RM-9EF41: Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-17]
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary [3-2]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary [3-9]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 100 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary [3-15]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** • Per 74RM-9EF41: Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer **OR** Valid dose assessment indicates > 1000 mrem/hr External EDE at the Site Boundary **OR** Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary [3-18]

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Unplanned radioactivity release which results in Site Boundary dose rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-3]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Unplanned radioactivity release which results in Site Boundary dose rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation [3-10]		
IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer Site Boundary dose rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-4]	**IC - Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Technical Specifications for 15 Minutes or Longer** Site Boundary dose rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation [3-11]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release** Site Boundary dose rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary [3-16]	**IC - Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology** Site Boundary dose rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation OR Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary [3-19]

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

Table 3: Radiological Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit [3-5] (normal levels comprise the highest reading in the past 24 hours excluding the current peak value)	**IC - Release of Radioactive Material or Increases in Radiation Levels within the Facility that Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are: (1) > 15 mR/hr: RU-18 Control Room **OR** (2) > 5000 mR/hr: RU-155 Main Steam Support Structure RU-153c Auxiliary Bldg. 100' East RU-23 Chemistry Hot Laboratory RU-19 Fuel Building [3-12]		
IC - Unexpected Increase in Plant Radiation or Airborne Concentration Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water [3-6]	**IC - Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel** Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal, i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication, such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur **AND** Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145 [3-13]		
IC - Fuel Clad Degradation RCS specific activity > Technical Specification allowable limits [3-7]			

Table 4: Leakage Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - RCS Leakage **Unidentified or pressure boundary leakage> 10 gpm in Modes 1-4 [4-1]**			
IC - RCS Leakage **Identified leakage > 25 gpm in Modes 1-4 [4-1]**			

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room for > 15 Minutes Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available [5-1]	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate a Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2 [5-4] (manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS Bus from the Control Room)	**IC - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful** Failure of RPS to initiate or complete an automatic reactor shutdown, i.e., subcritical, once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2 [5-7]	**IC - Failure of Reactor Protection System to Complete an Automatic Scram and Manual Scram Was NOT Successful and There is an Indication of an Extreme Challenge to the Ability to Cool the Core** Failure of RPS to complete an automatic reactor shutdown, i.e., subcritical, and manual shutdown was not successful when in Modes 1-2 AND CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained [5-11]
IC - Inability to Reach Required Shutdown Within Technical Specification Limits Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4 [5-2]	**IC - Inability to Maintain Plant in Cold Shutdown** Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6 [5-5]	**IC - Loss of Water Level in the Reactor Vessel that Has or Will Uncover Fuel in the Reactor Vessel** Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 40AO-9ZZ02, Excessive RCS Leakrate and Safety Analysis Operational Data) [5-8]	

Table 5: Malfunction Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio [5-3]	**IC - Unplanned Loss of Most or All Safety System Annunciation or Indication in the Control Room with Either (1) a Significant Transient in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable** Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress [5-6]	**IC - Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown** Loss of any function, i.e., heat removal, reactivity control, or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4 [5-9]	
IC - Unplanned Loss of All Onsite or Offsite Communications Capabilities Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system [5-3]		**IC - Inability to Monitor a Significant Transient in Progress** Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available [5-10]	

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification [6-1]	**IC - Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown** Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-9]	**IC - Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established** Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes [6-18]	
IC - Natural and Destructive Phenomena Affecting the Protected Area Explosion affecting the Protected Area resulting in visible damage, i.e., deformation, scorching, to permanent structures or equipment [6-2]	**IC - Control Room Evacuation Has Been Initiated** Entry into 40AO-9ZZ18, Shutdown Outside the Control Room, or 40AO-9ZZ19, Control Room Fire, for Control Room evacuation [6-10]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area [6-3]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Vehicle/aircraft crash or missile impact affecting plant vital areas [6-11]		
IC - Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant [6-4]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Visible structural damage to any building containing safe shutdown equipment [6-12]		

Table 6: Hazards Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals [6-5]	**IC - Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown** Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses [6-13]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Valid "Strong Motion Accelerometer SystemTrigger" indicated on Seismic Warning Panel per 79IS-9SM01 [6-6]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment [6-14]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Tornado affecting the Protected Area [6-7]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity [6-15]		
IC - Natural and Destructive Phenomena Affecting the Protected Area Flooding affecting the Protected Area [6-8]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58 [6-16]		
	IC - Natural and Destructive Phenomena Affecting the Plant Vital Area Flooding potentially affecting safety systems required for the current operating Mode [6-17]		

Table 7: Security Event Category (Modes 1-6 and defueled unless specified)

UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant [7-1]	IC - Security Event in a Plant Protected Area Security event within the Protected Area (RE: 40DP-0OP07) [7-2]	IC - Security Event in a Plant Vital Area Security event within any vital area (RE: 40DP-0OP07) [7-3]	IC - Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel [7-4]

Table 8: Miscellaneous Event Category (Modes 1-6 and defueled unless specified)			
UNUSUAL EVENT (NUE)	ALERT	SITE AREA EMERGENCY (SAE)	GENERAL EMERGENCY (GE)
IC - Natural and Destructive Phenomena Affecting the Protected Area Control Room assessment that an event has occurred affecting the Protected Area [8-1]	**IC - Natural and Destructive Phenomena Affecting the Plant Vital Area** Control Room assessment that an event has occurred affecting the plant vital areas [8-3]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate actual or likely major failure of plant functions needed for protection of the public [8-5]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a General Emergency** Other conditions exist which, in the judgment of the SM/EC, indicate: (1) actual or imminent substantial core degradation with potential for loss of CTMT, or (2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary [8-6]
IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event Other conditions exist which, in the judgment of the SM/EC, indicate a potential degradation of the level of safety of the plant [8-2]	**IC - Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert** Other conditions exist which, in the judgment of the SM/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted [8-4]		

Appendix B - Protective Action Recommendations

1.0 Precautions and limitations

1.1 In the event of a declaration of General Emergency, the response by the State of Arizona may involve actions to evacuate the public to include citizens out to ten miles in the Emergency Planning Zone. Note that the state's Protective Action Decision may differ from the site's Protective Action Recommendation.

1.2 The protective actions determined within this document are provided to offsite agencies as recommendations. Offsite agencies may employ conservative adjustments prior to issuing Protective Action Decisions. For this reason, it is essential that protective actions recommended to offsite agencies by PVNGS are accurate.

1.3 Environmental Protection Agency guidance stresses evacuation in lieu of shelter whenever possible. Shelter is appropriate only when evacuation cannot be implemented or when the duration of the release is expected to be shorter than the time period required to evacuate.

1.4 A Protective Action Recommendation may be based on the current emergency classification, current plant conditions, or on a dose projection. When a dose projection is unavailable or not applicable, the Protective Action Recommendation should be based on the current emergency classification or plant conditions.

1.5 The Emergency Operations Director shall be informed of the basis for all recommended protective actions submitted for issuance to the State of Arizona. The information should include any default or abnormal data used to determine the recommended protective action and a clarification of the effect these values may have on the recommended protective action.

1.6 If wind direction is unavailable from installed instrumentation and cannot be clearly determined by alternate means, e.g., the Unit 1 STA link to the RG system, the Protective Action Recommendation must be applied to all sectors. If ERFDADS is unavailable, meteorological information required by the Radiological Monitoring Technician can be obtained by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS. For this case, Delta-T will be derived by the Radiological Monitoring Technician. The Radiation Protection Monitor should ensure that the Emergency Coordinator is informed and that someone is sent to the Meteorological Tower for resolution of failure and to obtain local data, if possible.

2.0 PAR determination

2.1 Application of emergency classification

2.1.1 If any radiological thresholds in Section step 2.0 of Appendix A - Emergency Action Levels, exceed those which are appropriate for the current emergency classification, immediately inform the Emergency Coordinator that radiological conditions exist which warrant an escalation in the current emergency classification.

2.1.2 Using the PAR Table, ensure that the current Protective Action Recommendation meets the minimum required for the current emergency classification.

2.2 Application of plant conditions

2.2.1 Based on bounding projections for plant conditions, review possible radiological release paths / source terms with technical staff members.

2.2.2 If Radiological Field Assessment Team data is available, compare Site Boundary dose rates and sample results with the projections previously reviewed and select the most accurate Protective Action Recommendation appropriate to current plant conditions.

2.2.3 Compare the Protective Action Recommendation selected in the previous step with that selected as the minimum required for the current emergency classification and select the most conservative Protective Action Recommendation.

2.3 Application of dose projection

2.3.1 If dose projection results are available, compare the recommended protective action based on the most recent dose projection to that selected as the most conservative in the previous step and select the most appropriate Protective Action Recommendation.

2.3.2 Inform the Emergency Coordinator / Emergency Operations Director of the Protective Action Recommendation selected and the basis (i.e., defaults or abnormal data used and its effects) for the selected Protective Action Recommendation.

2.3.3 As time permits, complete Form EP-0381, Dose Projected PAR, and provide it to the Emergency Coordinator / Emergency Operations Director.

3.0 Protective Action Recommendations

3.1 Determine the appropriate protective actions using the table below and the RP Monitor's recommendations.

Protective Action Recommendations

CONDITION	RECOMMENDED ACTION
NOTIFICATION OF UNUSUAL EVENT or ALERT declared	NONE
SITE AREA EMERGENCY declared	SHELTER within a 2-mile radius
GENERAL EMERGENCY declared OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): 5 REM > TEDE $\geq$ 1 Rem 25 REM > TODE $\geq$ 5 Rem	EVACUATION for 2-mile radius and 5 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)
Large fission product inventory (> fuel clad gap activity) has been released to containment OR EPA Protective Action Guidelines are projected to be exceeded (at Site Boundary): TEDE $\geq$ 5 Rem TODE $\geq$ 25 Rem OR Imminent containment failure is projected such that a "puff" release > design leak rate will occur in conjunction with substantial core damage or large fission product inventory	EVACUATION for 5-mile radius and 10 miles in potentially affected sectors. (For a "puff" release, evacuation may take longer than the expected release duration - in these situations, consider SHELTER for areas that cannot be evacuated before plume arrival.)

Wind from	Affected Sectors	Distance to S.B.	Wind from	Affected Sectors	Distance to S.B.
169-191	R-A-B	0.82 (A)	349-011	H-J-K	1.68 (J)
192-213	A-B-C	0.83 (B)	012-033	J-K-L	1.14 (K)
214-236	B-C-D	1.58 (C)	034-056	K-L-M	0.75 (L)
237-258	C-D-E	1.37 (D)	057-078	L-M-N	0.63 (M)
259-281	D-E-F	1.34 (E)	079-101	L-M-N-P-Q	0.62 (N)
282-303	E-F-G	1.28 (F)	102-123	M-N-P-Q-R	0.63 (P)
304-326	F-G-H	1.31 (G)	124-146	N-P-Q-R-A	0.74 (Q)
327-348	G-H-J	1.88 (H)	147-168	Q-R-A	0.83 (R)

Appendix C - Forms

TABLE OF CONTENTS

SECTION PAGE

1.0 Precautions and limitations

1.1 Forms in this appendix are to be considered "samples." In accordance with 01DP-0AP01, Procedure Process," the user may copy a sample form from the procedure if the copy is legible enough to use.

1.2 Forms in this appendix are available on the PVNGS Local Area Network (LAN), on drive V:, in directory \Eplan\Forms.

2.0 Forms

2.1 Form EP-0010, Logistics Overview (sample)

FORM EP-0010A **PVNGS EMERGENCY PLANNING**

LOGISTICS OVERVIEW

Name: ____________ **Time:** ________ **Date:** ________

A. ERO Shift Schedule *(describe any abnormalities)*:

____
____
____
____

B. Status of onsite emergency response facilities and equipment:

STSC: ______________________________
TSC: ______________________________
OSC: ______________________________
EOF: ______________________________

C. Additional manpower / equipment / documentation support needed *(status, problems, etc.)*:

____
____
____
____

D. American Nuclear Insurers *(ANI)* informed of current status *(if applicable, state comments)*:

____

E. Additional information *(if applicable)*:

____
____
____
____

2.2 Form EP-0011, Personnel Shift Staffing, page 1 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

PERSONNEL SHIFT STAFFING ***(Part 1 of 5)***

Complete the checklist below and the attached emergency response facility staffing sheets as necessary to ensure effective transition between shifts. Brief the EOD on staffing requirements, if applicable.

Complete the following items as soon as possible:

____ Staffing established for 2 shifts - EOD briefed as applicable

____ Individual staff members informed of shift assignment and time of shift work hours

____ Emergency response facility staffing boards updated to reflect shift schedules

Complete the following items at shift change:

____ Formal turnover for each position regarding emergency status and duties and responsibilities

____ Staff members briefed on any abnormalities or problems encountered or anticipated

____ Ensure facility managers brief off-going staff on the following items applicable to their facility:

- ____ significant events leading to current plant status
- ____ current emergency classification level
- ____ current Protective Action Recommendation and decisions by the State of AZ
- ____ radiological status
- ____ corrective actions taken thus far
- ____ prognosis on plant status and current state of the emergency

____ On-coming staff assumes duties and responsibilities for their respective positions

____ Shift change occurs

____ Facility managers advised on status of shift change

____ Emergency response facility staffing boards updated to reflect current staff members on shift

2.3 Form EP-0011, Personnel Shift Staffing, page 2 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

SATELLITE TECHNICAL SUPPORT CENTER *(Part 2 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Advisor			
Radiation Protection Monitor ◆			
Shift Technical Advisor ◆			
STSC Communicator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.4 Form EP-0011, Personnel Shift Staffing, page 3 of 5 (sample)

FORM EP-0011 D **PVNGS EMERGENCY PLANNING**

TECHNICAL SUPPORT CENTER *(Part 3 of 5)*			
POSITION	*DAYS*	*NIGHTS*	*ALTERNATE*
Onsite Emergency Coordinator ◆			
Administrative Support (two)			
Chemistry Coordinator			
Electrical Engineering ◆			
Emergency Coordinator Technical Asst.			
Emergency Maintenance Coordinator ◆			
Mechanical Engineering ◆			
Operations Coordinator ◆			
Probabilistic Risk Assessment			
Radiation Protection Support Technician			
Radiological Protection Coordinator ◆			
Reactor Analyst ◆			
Safety Analysis Engineer			
Security Director ◆			
Shift Technical Advisor			
Technical Engineering Manager ◆			
USNRC Liaison Operations			
OTHER:			
Facility Advisor			
Plant Status Technician			
Shift Technical Advisor *(additional)*			

◆ - position required for facility activation

2.5 Form EP-0011, Personnel Shift Staffing, page 4 of 5 (sample)

FORM EP-0011 c **PVNGS EMERGENCY PLANNING**

OPERATIONS SUPPORT CENTER *(Part 4 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Operations Support Center Coordinator ◆			
Chemistry Technician			
Electrical Maintenance Technician			
Fire Protection / EMT			
Instrumentation and Control Technician			
Mechanical Maintenance Technician			
Radiation Protection Technician ◆			
Radiological Monitoring Technician			
Repairs Coordinator ◆			
OTHER:			
Facility Advisor			

◆ - position required for facility activation

2.6 Form EP-0011, Personnel Shift Staffing, page 5 of 5 (sample)

FORM EP-0011 D PVNGS EMERGENCY PLANNING

EMERGENCY OPERATIONS FACILITY *(Part 5 of 5)*			
POSITION	***DAYS***	***NIGHTS***	***ALTERNATE***
Emergency Operations Director ◆			
Administrative and Logistics Coordinator			
Administrative Support (two)			
Dose Assessment Health Physicist ◆			
Government Liaison ◆			
Information Coordinator			
Radiation Protection Support Technician			
Radiological Assessment Communicator			
Radiological Assessment Coordinator ◆			
Security Coordinator ◆			
Shift Technical Advisor			
Systems Engineering			
Technical Analysis Manager ◆			
USNRC Liaison Health Physics			
OTHER:			
Ass't Emergency Operations Director			
Facility Advisor			
Plant Status Technician			

◆ - position required for facility activation

2.7 Form EP-0012, Emergency Action Log (sample)

FORM EP-0012A PVNGS EMERGENCY PLANNING

EMERGENCY ACTION LOG

Name:	Position:	Facility:	Date:

TIME	ACTION

2.8 Form EP-0013, Duty Contact Register (sample)

FORM EP-0013B PVNGS EMERGENCY PLANNING

DUTY CONTACT REGISTER

INSTRUCTIONS

NOTE: Per 10 CFR 26.20(e), any individual offsite reporting for duty in the TSC and/or EOF shall be questioned on Fitness for Duty and the response(s) shall be recorded.

Complete the following information:

- print the following: individual name / current time / facility where reporting
- record both responses to the following questions in the appropriate blanks:

Question 1: *"Have you abstained from alcohol for the past 5 hours?"*
Question 2: *"Are you fit for duty?"*

Name of Individual	*Time*	*For Facility...*	*Response(s) to Questions*
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -
			1 -
			2 -

Reviewed by: ______________________ Date: ______________
(Signature)

Reviewer: Review / sign this form and submit it to the EC or EOD when completed. Ensure that the facility leader for each individual reporting for duty is made aware of any individual's condition where alcohol has been consumed.

2.9 Form EP-0021, FAX Cover (sample)

FORM EP-0021 A **PVNGS EMERGENCY PLANNING**

ARIZONA PUBLIC SERVICE COMPANY

Palo Verde Nuclear Generating Station

FAX Cover Sheet

TO: ______________________________

PHONE: ______________ | ______________
VOICE *FAX*

FROM: ______________________________

PHONE: ______________ | ______________
VOICE *FAX*

PAGES: ______________________________
INCLUDING FAX COVER SHEET

Emergency Planning

PALO VERDE

2.10 Form EP-0022, EOF Document Distribution (sample)

FORM EP-0022A **PVNGS EMERGENCY PLANNING**

EOF DOCUMENT DISTRIBUTION

Name: ____________ **Date:** ____________ **Time:** ____________

Retrieve Form EP-0381 and the MESOREM print report from the RAC / Dose Assessment Health Physicist workstations and proceed to the copy machine. Make the following number of copies:

Form EP-0381: 12
MESOREM print report: 5 *(original may be several pages)*

Return the originals to the RAC / Dose Assessment Health Physicist workstations.

Distribute copies of both documents per the following lists *(some copies must be transmitted via FAX)*:

DOCUMENT	POSITION TITLE	COPIES	
Form EP-0381:	Arizona Radiation Regulatory Agency *(TOC)*	1	
	Emergency Operations Director *(EOF)*	1	
	Government Liaison *(EOF)*	1	
	Radiation Protection Support Technician *(EOF)*	1	
	Radiation Protection Technician *(OSC)*	1	
	Radiological Assessment Communicator *(EOF)*	1	
	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	Radiological Status Board *(EOF)*	1 ★	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	
MESOREM Print Report:	Radiological Assessment Coordinator *(EOF)*	1	
	Radiological Protection Coordinator *(TSC)*	1	
	State of Arizona Representative *(EOF)*	1	
	USNRC Liaison Health Physics *(EOF)*	2	

★ replace the old form

2.11 Form EP-0030, Chemistry Status (sample)

FORM EP-0030A **PVNGS EMERGENCY PLANNING**

CHEMISTRY STATUS

Name:	Date:	Time:
SAMPLE ANALYSES		
Reactor Coolant System	***Containment***	***Secondary***
POST ACCIDENT SAMPLING EVALUATION		
RCS:		
Containment:		
RU-144:		
RU-146:		

STEAM GENERATOR HYDROGEN BUBBLE	**RECOMMENDATION TO REDUCE STEAM GENERATOR HYDROGEN**
#1 Steam Generator: Y (___ %) N	
#2 Steam Generator: Y (___ %) N	

COUNT ROOM STATUS

OTHER INFORMATION

2.12 Form EP-0051, Chemistry Cart #1 Preparation Checklist (sample)

FORM EP-0051 B **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #1 PREPARATION CHECKLIST

Name:	Date:	Time:
NOTE: This cart preparation can be used for obtaining either liquid or gas samples		

MATERIALS	✓
Modified lead brick *(made to contain three 7-ml liquid vials)*	
Modified lead brick *(made to contain three 9.2-cc gas vials)*	
Adjustable pipettes *(with pipette tips)* in ranges to allow for sample distribution and dilutions	
Beaker with de-ionized water *(≥ 50 ml)*	
2 gas-tight *(twist-lock)* 1-cc syringes	
10-ml liquid syringe with a 1½-inch needle	
Plastic paper / plastic bags / parafilm to hold the 7-ml / 9.2-cc gas vial after final dilution and prior to counting	
Labels for chemistry samples	
1-inch thick lead carrying case *(pig)*	
Absorbent paper	
Three 9.2-cc gas vials with septums *(one of them evacuated by 0.1 cc)*	
Three 7-ml liquid vials with screw caps	
Needle-nose pliers	
Parafilm	
Lead bricks *(place one lead brick in front and one behind each of the modified dilution lead bricks)*	
Calculator	
Scissors	

COMMENTS

Prepared by: ______________________ ______________
(Signature) *(Date)*

2.13 Form EP-0052, Chemistry Cart #2 Preparation Checklist (sample)

FORM EP-0052A PVNGS EMERGENCY PLANNING

CHEMISTRY CART #2 PREPARATION CHECKLIST

Name:	Date:	Time:
NOTE: This cart preparation can be used for obtaining either liquid or gas samples as designated		

MATERIALS	
LIQUID:	
1-ml *(B-D)* liquid syringe	
6-inch syringe needle	
2-inch thick lead pig *(fabricated for a 3½-ml glass vial)*	
3½-ml glass vial	
Parafilm	
Temporary syringe disposal cask	
500-ml beaker *(for temporary disposal of used pipette tips, needles, etc.)*	
GAS:	
2 gas-tight *(twist-lock)* 1-cc syringes	
1-inck thick lead syringe carrying case	
Temporary syringe disposal cask	
Remote tools *(two sets may be needed if transporting to an Unaffected Unit)*	
Gas syringe carrying case *(aluminum case to accommodate syringe and handling tool)*	
BOTH - REMOTE TOOLS:	
Syringe handling tool *(two sets may be needed for gas sampling if a gas sample is to be transported to an Unaffected Unit)*	
Syringe locking / unlocking device	

COMMENTS

Prepared by: ______________________ (Signature) ______________ (Date)

2.14 Form EP-0053, Chemistry Cart #3 Preparation Checklist (sample)

FORM EP-0053A **PVNGS EMERGENCY PLANNING**

CHEMISTRY CART #3 PREPARATION CHECKLIST

Name:	Date:	Time:

NOTE: This checklist is generally performed by the Radiological Monitoring Technician and can be used for obtaining RMS HI-Range skid samples

MATERIALS	
Sample handling tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Latch handle tool *(stored in the 140-foot elevation OSC Emergency Kit)*	
Portable transfer pig	
KEPIC *(if required)*	
Loaded special RMS filter head	
Plastic bags	
Tweezers	
Petri dishes	
RMS keys	

COMMENTS

Prepared by: ______________________ ______________________
(Signature) *(Date)*

2.15 Form EP-0054, Accident Sample Worksheet (sample)

FORM EP-0054A PVNGS EMERGENCY PLANNING

ACCIDENT SAMPLE WORKSHEET

Name:	Date:	Time:	
DOSE DATA			
(AS REQUIRED FOR SAMPLE TYPE)	***CONTACT***	***1-FOOT***	***3-FEET***
Septum Ports			
Syringe			
RMS Skid Working Area			
RMS Sample Chamber *(door open)*			
Top of Unshielded Sample in Pig			
Pig Top			
Pig Side			

SAMPLE DATA LOG

(AS REQUIRED FOR SAMPLE TYPE)

RU-_______ Chamber # _______ Sample Volume _______________ Cubic Feet

(original volume uncorrected for iodine plate-out)

Grab Sample Collection Duration _______ Seconds

Sample Start: Date: _______ Time: _______ Flow: _______ CFM

Sample Stop: Date: _______ Time: _______ Flow: _______ CFM

TEAM DATA

Team Number: _______________

Team Members: _______________ _______________

_______________ _______________

_______________ _______________

COMMENTS

____

____

____

____

____

Prepared by: ____________________ __________

(Signature) *(Date)*

2.16 Form EP-0055, RMS Skid Collection Time Calculation (sample)

FORM EP-0055A **PVNGS EMERGENCY PLANNING**

RMS SKID COLLECTION TIME CALCULATION

Name:	Date:	Time:

RMS SKID SAMPLE DATA
SAMPLE COLLECTION TIME CALCULATION

Monitor Number: ______________

Monitor Reading *(M)*: ______________ µCi/cc Sample Flow: __________ CFM

Collection Time *(seconds)* Calculation:

$$T_{sec} = \frac{\text{Sample } (\mu Ci)}{(M) \times (R) \times (F) \times (472) \times (0.04)}$$

where:

T_{sec} and Sample µCi are variables - either a specific sample time or a specific sample activity may be entered and the other variable will be calculated. **Always ensure that the final sample activity will be below the 0.25 Ci sample counting limitation.**

M = current µCi/cc monitor indication

R = ratio of I/NG - use a known value from analysis *(if available)* or as below:
(based on UFSAR 6.3.3.6 Source Term for 100% failed fuel)

- 2.20E-02 I/NG for LOCA or Fuel Handling Accident
- 5.70E-04 I/NG for S/G Tube Leak condition

F = current sample flow *(not process)* in CFM

472 = net unit conversion factor: *[(cc/sec) divided by (ft^3/min)]*

0.04 = Iodine plate-out factor

NOTE

Select a collection time that is less than the calculated maximum.
If the calculated maximum is less than 60 seconds, use 60 seconds as the minimum time.

Calculated T value: ________ seconds Selected T value to be used: ________ seconds

Calculated by: ______________________________ Date: ____________
(Signature)

Print Name: ______________________________

Reviewed by: ______________________________ Date: ____________
(Signature)

2.17 Form EP-0130, Plant Maintenance Status (sample)

FORM EP-0130A PVNGS EMERGENCY PLANNING

PLANT MAINTENANCE STATUS

Name:	Date:	Time:
EQUIPMENT STATUS		
Damage	**Repair Effort*(s)***	
Electrical:	Repair Team:	
Mechanical:	Repair Team:	
Instrumentation:	Repair Team:	
TOOLS / SPARE PARTS		
HAZARDS		
Chemical:		
Fire:		
Medical:		
Toxic:		
WATER SUPPLY STATUS		
Primary Systems:		
Secondary Systems:		
Spray Pond*(s)*:		
MISCELLANEOUS		
Radiological Condition*(s)*:		
Decontamination:		
Support Personnel:		
TSC Panel AJ-SDN-UA-001 Status:		

2.18 Form EP-0131, In-plant Team Briefing (sample)

FORM EP-0131 A PVNGS EMERGENCY PLANNING

IN-PLANT TEAM BRIEFING

OSC Coordinator

TEAM IDENTIFICATION	Team Members: *(Ldr)*:
Team Name:	
Plant Location:	
Purpose:	

Radiation Protection

EXPECTED WORK AREA CONDITIONS				
REP Number:	Dose Rates:			
Contamination:	Airborne:	Respirator: Y N		
PROTECTIVE REQUIREMENTS (In addition to those specified on REP)				
Dosimetry:				
PCs:				
Communications Links:				
SPECIAL INSTRUCTIONS				
Are Emergency Exposure/KI actions required for any team member?	Y	N		
If Y*(es)*, has required documentation been completed?	Y	N		
Hold Points:				
Abort Points	Dose Rate:	Dose:	Time:	
	Other:			

OSC Coordinator / Radiation Protection

BRIEFING	
Travel Route Summary:	
Personnel Hazards:	
Tools / Equipment:	
Additional Materials:	
Time Briefing Conducted:	Time Team Dispatched:
Conducted by:	Time Team Returned:
DEBRIEF COMMENTS	

2.19 Form EP-0231, Draft Information - NUE (sample)

FORM EP-0231 A PVNGS EMERGENCY PLANNING

NOTIFICATION OF UNUSUAL EVENT

DRAFT INFORMATION

Wintersburg, AZ – A Notification of Unusual Event was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Injuries - describe and indicate if contaminated**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material.

2.20 Form EP-0232, Draft Information - Alert (sample)

FORM EP-0232A **PVNGS EMERGENCY PLANNING**

ALERT

DRAFT INFORMATION

Wintersburg, AZ -- An Alert was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

No one has been injured *(if applicable)* and there is no threat to the health and safety of the public or plant workers, nor has there been any release of radioactive material *(if applicable)*.

2.21 Form EP-0233, Draft Information - SAE (sample)

FORM EP-0233A PVNGS EMERGENCY PLANNING

SITE AREA EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A Site Area Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.22 Form EP-0234, Draft Information - GE (sample)

FORM EP-0234A **PVNGS EMERGENCY PLANNING**

GENERAL EMERGENCY

DRAFT INFORMATION

Wintersburg, AZ -- A General Emergency was declared at Palo Verde Nuclear Generating Station Unit ______ *(1 / 2 / 3)* on ______ *(date)* at ______ *(time)* due to the following reason:

____

____

____

____

ITEMS TO INCLUDE, IF APPLICABLE:

- **Current plant status, including other Units**
- **Status of corrective actions**
- **Radioactive material / gases release**
- **Injuries - describe and indicate if contaminated**
- **Assembly and Accountability**
- **Evacuation of non-essential personnel**

____

____

____

____

2.23 Form EP-0235, Site-Wide Announcement Worksheet (sample)

FORM EP-0235A **PVNGS EMERGENCY PLANNING**

SITE-WIDE ANNOUNCEMENT WORKSHEET

Name:	Facility:	Date:	Time:

INSTRUCTIONS

Complete the relevant blanks with a summary of information and perform a Site-Wide Announcement. Strike out any portions not applicable to the event.

Attention all plant personnel -- Attention all plant personnel.

On ______ (*date*) **at** ______ (*time*), **a(n)** ______ (*emergency classification*) **was declared in Unit** ______ (*Unit*) **due to** ______ (*reason (see applicable EAL Status Codes)*).

Corrective actions applied have been ______ (*summary of corrective actions*)

______.

The current plant status is ______ (*information summary*).

A radiological release **<u>is</u>** **<u>is not</u>** **in progress at this time.**

The wind is currently <u>from</u> the ______ (*direction*) **at** ______ (*speed*) **miles / hour.**

The current Protective Action Recommendation provided to the State of Arizona is:

______ (*from Emergency Operations Director or designee*).

Personnel injuries include ______ (*number and nature of injuries*).

Fire / hazardous chemical status is ______ (*information summary*).

Personnel Assembly was directed on ______ (*date*) **at** ______ (*time*).

Site Evacuation was directed on ______ (*date*) **at** ______ (*time*).

Specific instructions: ______ (*information summary*)

2.24 Form EP-0240, EC Turnover Summary (sample)

FORM EP-0240A **PVNGS EMERGENCY PLANNING**

EC TURNOVER SUMMARY

Onshift EC Name: ____________	Date: ________
Onsite EC Name: ____________	Time: ________

CURRENT CONDITIONS

Emergency Classification declared at: ________ *(date)* ________ *(time)* in Unit: ____

EAL Status Code*(s)*:

Initiating Event Summary:

Summary of Plant Status:

Procedure*(s)* in Use:

Corrective Action*(s)* Applied:

CRITICAL SAFETY FUNCTION STATUS

Safety Function*(s)* Currently Jeopardized:

PROTECTIVE ACTION RECOMMENDATIONS

Radiological Release? *(Y/N)*: Describe:

PAR issued: at: ________ *(date)* ________ *(time)*

State Protective Action Decision:

Medical / Fire / etc? *(Y/N)*: Describe:

OTHER INFORMATION

2.25 Form EP-0300, Authorization for Dose Beyond 10CFR20 limits (sample)

FORM EP-0300 A **PVNGS EMERGENCY PLANNING**

AUTHORIZATION FOR DOSE BEYOND 10CFR20 LIMITS

Name:	Date:	Time:	Unit:

ORIGINATOR

Authorization Requested For:

Individual Name: ______________________

HPID: ________ SSN: ____________ REP Number: ____________

Reason for Request: ______________________________________

DOSE REQUEST

Circle one limit in each column or enter a lower limit in the appropriate box of each column:

DOSE LIMITS	TEDE	TODE and Thyroid CDE	LDE	SDE
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM / year	50 REM ★ / year	15 REM / year	50 REM / year
EPA Guidance for Protecting Valuable Property	10 REM	100 REM	30 REM	100 REM
EPA Guidance for Life-Saving or Protection of Large Populations	≤ 25 REM	≤ 250 REM	≤ 75 REM	≤ 250 REM
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM	> 250 REM	> 75 REM	> 250 REM

★ Sum of Deep Dose Equivalent and Committed Dose Equivalent *(DDE + CDE)*. EPA does not use TODE *(Total Organ Dose Equivalent)*; EPA uses CDE in this column. PVNGS assesses TODE and, via Emergency Exposure and KI guidelines and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

AUTHORIZATION AND APPROVAL

NOTE: **For dose authorizations > 25 REM, a risk discussion is required per 16IG-0EP051, Emergency Exposures and KI, Section 6, Team Briefing and Deployment, if time permits**

I have received NO previous life-saving exposure: ____________ *(radiation worker signature)* ______ *(date)*

If authorized dose > 25 REM, my assignment is voluntary and I have received a risk discussion briefing: ____________ *(radiation worker signature)* ______ *(date)*

I have reviewed my dose records. I am aware that, although dose received under this authorization is beyond 10 CFR 20 limits during the emergency, the dose received will be added to my dose records and subject to 10 CFR 20: ____________ *(radiation worker signature)* ______ *(date)*

Radiation Protection Monitor / Radiological Protection Coordinator: ____________ *(RPM / RPC signature)* ______ *(date)*

Authorized for dose requested as stated above: ____________ *(Emergency Coordinator signature)* ______ *(date)*

DOSIMETRY RECORD UPDATE

Dosimetry record update performed by:

____________ *(print)* ____________ *(signature)* ______ *(date)* ______ *(system)*

F_EP0300.DOC 08/01/99 23:41:39

2.26 Form EP-0301, TLD Distribution (sample)

FORM EP-0301 A **PVNGS EMERGENCY PLANNING**

TLD DISTRIBUTION

Monitor Name:	***Date:***
Location:	

Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		
Name:		SSN:
Mailing Address:		
City:	State:	ZIP:
Telephone Number:		
Thermoluminescent Dosimeter *(TLD)* Number:		Date of Issue:
Extremity TLD *(Number and location worn)*:		

2.27 Form EP-0330, Plant Status Overview (sample)

FORM EP-0330 **PVNGS EMERGENCY PLANNING**

PLANT STATUS OVERVIEW

TIME: DATE: EMERGENCY CLASS: PALO VERDE UNIT: Mw CE POWER:

REACTOR	PRIMARY COOLANT	ECCS	SECONDARY PLANT	CONTAINMENT	ELECTRICAL
POWER LEVEL: TREND	RCP AUX. AVAIL. (Y/N)	SIAS (Y/N):	STEAM GENERATORS	CIAS (Y/N):	OFFSITE AC (Y/N):
%	1A 1B 2A 2B	HPSI PUMPS RUNNING(Y/N):	LEVEL (% WR):	CSAS (Y/N):	ONSITE POWER (Y/N):
CORE EXIT TEMP:	RCP's RUNNING (Y/N):	SIA SIB	1 2	ISOLATED (Y/N):	DIESEL GENERATORS:
°F	1A 1B 2A 2B	HPSI FLOW (GPM):	PRESSURE (PSIA):	PRESSURE: TREND	A: VAC
HIGHEST INCORE THERMOCOUPLE TEMP:	LOOP T-COLD (°F):	1A: 1B:	1 2	PSIG	B: VAC
°F	1A 1B 2A 2B	2A: 2B:	ISOLATED (Y/N):	TEMPERATURE:	VITAL BUS STATUS:
RX VESSEL WATER LEVEL:	LOOP T-HOT (°F):	HL1: HL2:	1 2	°F	PBAS03: VAC
	1 2	CHARGING FLOW:	MAIN FEED FLOW (LBM/HR):	H_2 CONCENTRATION (%)	PBBS04: VAC
HEAD % PLNM %	TEMP SUBCOOL: TREND	GPM	1 2	A: B:	125 VDC:
SHUTDOWN (Y/N):	°F	LPSI PUMPS:	AUXILIARY FEEDWATER	CONTAINMENT SPRAY:	PKA PKB
CONTROL RODS IN (Y/N):	PRESSURIZER PRESSURE:	A: GPM	RUNNING:	A: B:	PKC PKD
COOLING METHOD:	PSIA	B: GPM	A / B / N	SUMP LEVEL: TREND	UPS STATUS:
	PRESSURIZER LEVEL:	RWT LEVEL: TREND	AUX FEED FLOW:	A: IN	
EMERGENCY BORATE (Y/N):	%	%	SG1: GPM	B: IN	
	PRESSURIZER TEMP:	SIT LEVEL (% WR):	SG2: GPM	RADIATION:	
BORON CONC (ppm):	°F	1A 1B	TOTAL FLOW: TREND	RU148 mR/HR	
	RDT LEVEL: %	2A 2B	SG1: GPM	RU149 mR/HR	
	LEVEL CONTROL METHOD:		SG2: GPM	RECOMBINERS (Y/N):	
			CST LEVEL: FT	A: B:	
	GAS CONC (CC stm/kg):		ADVs IN USE (Y/N):	AIR COOLERS:	
	H_2 N_2 Xe Kr		SBCS IN USE (Y/N):	A B C D	
	SPEC ACTIVITY (uCi/ml):			SPEC CONC (uCi/ml):	
	TOTAL: I:			TOTAL: I:	

COMMENTS:

2.28 Form EP-0350, Radiological Status (sample)

FORM EP-0350A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL STATUS

Date: Time: Accident Unit *(1 / 2 / 3 / common)*:

RELEASE PATH USED FOR PROJECTION

☐ Steam Generator Tube Rupture *(1% failed fuel)*
☐ Steam Generator Tube Rupture *(100% failed fuel)*
☐ LOCA *(1% failed fuel)*
☐ LOCA *(100% failed fuel)*
☐ Isolated Containment
☐ Fuel Handling Accident
☐ Waste Gas Decay Tank Accident
☐ Unmonitored Release Accident

Emergency initially declared: Time *(hh:mm)*: __________ Date *(mm/dd/yy)*: __________

Is a release currently in progress? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: __________

Release rate *(if known)*: Iodine: __________ µCi/sec Noble Gas: __________ µCi/sec

Simultaneous release? ☐ Yes ☐ No

Expected total release duration *(hh:mm)*: __________ *(default = 02:00)*

Has the reactor been scrammed? ☐ Yes ☐ No If Yes, for how long? *(hh:mm)*: __________

METEOROLOGICAL DATA

Weather: ☐ Normal ☐ Adverse Wind Speed is ______ *(at 35 feet)* mph from ______ *(at 35 feet)* degrees

Δ-T: ______ Ambient temperature: ______

CURRENT RADIATION MONITORING SYSTEM DATA

RMS Monitor: __________ RMS Monitor Reading: __________ µCi/cc or __________ mrem/hr

Process Flowrate: __________ cfm Iodine Filtration: __________ % *(default = 95%)*

Grab sample analysis: ☐ Complete *(see below)* ☐ Incomplete

MISCELLANEOUS INFORMATION

Isolated Containment *(leakage)*: ☐ 852 cc/sec *(default)* ☐ Other: __________ cc/sec

NOTE: Maximum steam flow *(or 100% open valve position)* will result in a very conservative release projection. Validate the release projection with field team data as soon as practicable.

S/G Tube Rupture: Affected loop Hot Leg temperature *(if steam release from S/G)*: ______ °F

Affected steam line flow rate: __________ lbm/hr *(from ERFDADS or CR)*

S/G level > 97% WR or indication of liquid entrained release? ☐ Yes ☐ No

Fuel Handling Accident: Fuel assembly age *(time since last critical)*: ______ hours *(from Rx Eng or STA)*

Waste Gas Decay Tank: Elapsed time since isolated: ______ hours *(maximum 999 hours)*

GRAB SAMPLE ANALYSES

Sample Number: __________ Sample analysis time *(hh:mm)*: __________

Comments:

Name: __________ *(print)* Position: __________ *(ERO)*

2.29 Form EP-0381, Dose Projected PAR (sample)

FORM EP-0381 c PVNGS EMERGENCY PLANNING

DOSE PROJECTED PAR

Date: ______________ Time: ______________

A release at this time is *(circle one)*: in progress not in progress

The release is *(circle one)*: monitored unmonitored N/A

The release is *(circle one)*: filtered unfiltered N/A

The release pathway is *(check all that apply)*:

☐ Containment ☐ Plant Vent ☐ Fuel Building ☐ Steam Line ☐ N/A

☐ Other: ______________________________

RMS Monitor: ______________ RMS Monitor Reading: ______________

The expected release duration is: ________ hours *(default = 2 hours)*

15 minute average wind speed is ________ *(at 35 feet)* mph from ________ *(at 35 feet)* degrees

MESOREM projected Stability Class is *(circle one)*:

A B C D E F G

(unstable) *(neutral)* *(stable)*

MESOREM projected Mixing Depth: ________ meters

MESOREM projected release rates *(μCi/sec)* are:

Iodine: ______________ Noble Gas: ______________

Time since scram: ______ Hrs ______ Min *(from STA)* Release in progress: ______ Hrs ______ Min *(from STA)*

The plume centerline projected dose *(in mrem)* based on a ______ - hour release is:

Distance	Sector(s)	TEDE	Thyroid CDE	TODE
SB				
2 miles				
5 miles				
10 miles				

NOTE: As a minimum, enter data for the Site Boundary (SB) fields.

PAR: ______________________________

2.30 Form EP-0481, Air Sample Data (sample)

FORM EP-0481B **PVNGS EMERGENCY PLANNING**

AIR SAMPLE DATA

Sample Number:	Sample Date:	Sample Time:
Sample Location:		

PARTICULATE

Filter *(net cpm)*	X	Calculation Constant ★	=	Particulate Concentration	
______	X	1.6E-11	=	______	μCi/cc

IODINE *(Label Iodine cartridge for transport to laboratory)*

If frisker is on-scale, Silver Zeolite *(net cpm)*	X	Calculation Constant ★	=	Iodine Concentration	
______	X	3.2E-11	=	______	μCi/cc

If frisker is off-scale-HI, obtain a closed-window RO-2 contact reading *(mrem/hr)* on the cartridge and multiply the RO-2 reading by the appropriate conversion factor and by 1.0E-06 to obtain a μCi/cc value:

(RO-2 closed-window reading) X (Conversion Factor) X (1.0E-06) = (I^{131} Equiv. Concentration in μCi/cc)

______ X ______ X 1.0E-06 = ______ μCi/cc

Multiply the I^{131} Equiv. Concentration by 1.3E+06 to obtain the equivalent Thyroid CDE dose rate:

______ μCi/cc *(previous line)* X 1.3E+06 = ______ REM / hour

Hours Since Reactor Shutdown:	0 - 4	5 - 7	8 - 12	13 - 18	19 - 24	25 - 36	> 36
Conversion Factor:	2	3	4	6	7	10	20

NOBLE GAS *(Label Noble Gas samples for transport to laboratory)*

★ The displayed Calculation Constant is based on an assumed sample volume of 10 cubic feet. For sample volumes other than 10 cubic feet, multiply concentration by 10 and divide by actual sample volume *(cubic feet)*.

2.31 Form EP-0482, Field Team Survey (sample)

FORM EP-0482A **PVNGS EMERGENCY PLANNING**

FIELD TEAM SURVEY

DATE:

TIME	LOCATION	DOSE RATES (*mrem/hr*) 3 FEET WO	WC	3 INCHES WO	WC	AIR SAMPLES (*µCi/cc*) PART	(*µCi/cc*) IODINE

2.32 Form EP-0483, Field Team Plume Sample (sample)

FORM EP-0483B PVNGS EMERGENCY PLANNING

FIELD TEAM PLUME SAMPLE

RFAT NUMBER:	TIME:	
PLUME LOCATIONS		
1. EDGE:		
2. CENTERLINE:		
3. EDGE:		
CENTERLINE SURVEY DATA		
	3 FEET	3 INCHES
OPEN WINDOW *(mrem/hr)* • GROSS UNCORRECTED READING •		
CLOSED WINDOW *(mrem/hr)*		

PARTICULATE CONCENTRATION	=	____________	µCi/cc
divided by 3.00E-09 µCi/cc per DAC	=	____________	DAC
times 2.5 mrem/hr per DAC	=	____________	mrem/hr CEDE
IODINE CONCENTRATION	=	____________	µCi/cc
divided by 2.00E-08 µCi/cc per DAC	=	____________	DAC
times 25 mrem/hr per DAC	=	____________	mrem/hr Thyroid CDE

TEAM EXPOSURE		
NAME:		
EXTERNAL EDE *(mrem)*		
DAC-Hours		
Time in Plume		

(Authorized TEDE X selected External EDE / TEDE ratio = Allowed External EDE mrem)

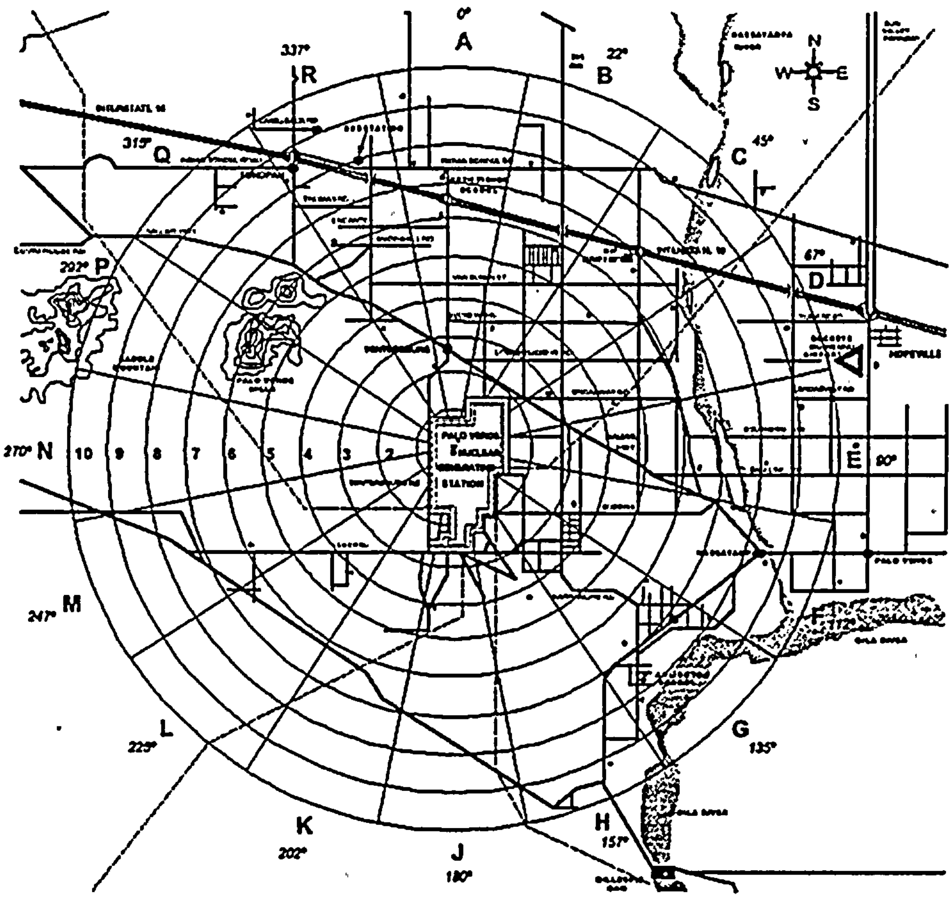
OTHER INFORMATION

NOTE: Information for identified fields represents the minimum to be reported

2.33 Form EP-0484, Plume Data Map (sample)

FORM EP-0484A **PVNGS EMERGENCY PLANNING**

PLUME DATA MAP



DATE: ___________ TIME: ___________ Rx TRIP TIME: ___________

START OF RELEASE: ___________ (DATE) ___________ (TIME) STABILITY CLASS: ___________

WIND: ___________ MPH FROM ___________

2.34 Form EP-0500, Radiological Protection Summary (sample)

FORM EP-0500A **PVNGS EMERGENCY PLANNING**

RADIOLOGICAL PROTECTION SUMMARY

DATE:	TIME:
EMERGENCY CLASSIFICATION: NUE ALERT SAE GE	
Radiological Events Driving Classification:	
Radiological Status: • A release IS IS NOT in progress at this time from ________________ *(release point)* • Current wind speed is _______ mph at 35' elevation from _______ degrees at 35' elevation	
Corrective Actions Implemented:	
PVNGS PROTECTIVE ACTION RECOMMENDATIONS	***GOVERNMENT PROTECTIVE ACTION DECISIONS***
Plant Activities (circle appropriately): • ASSEMBLY ACCOUNTABILITY EVACUATION • CONTAMINATED INJURIES LIFE-THREATENING INJURIES • OTHER:	

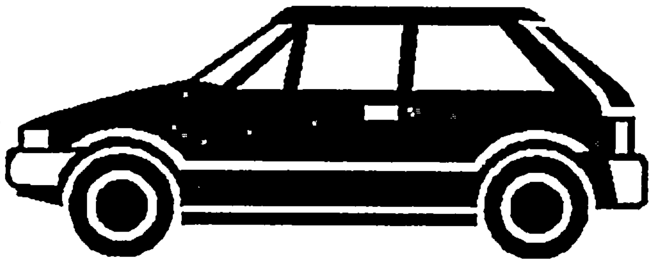
F_EP0500.DOC 07/31/99 20:24:00

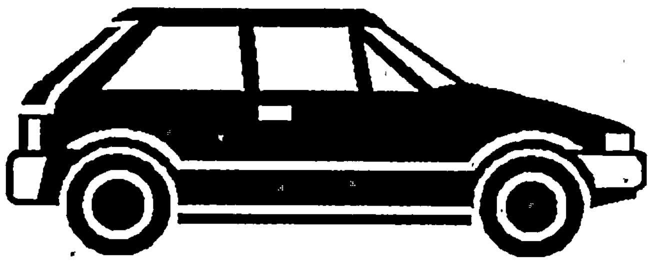
PV216-06NI (9-88)

2.35 Form EP-0501, Vehicle Decontamination (sample)

FORM EP-0501 A **PVNGS EMERGENCY PLANNING**

VEHICLE DECONTAMINATION



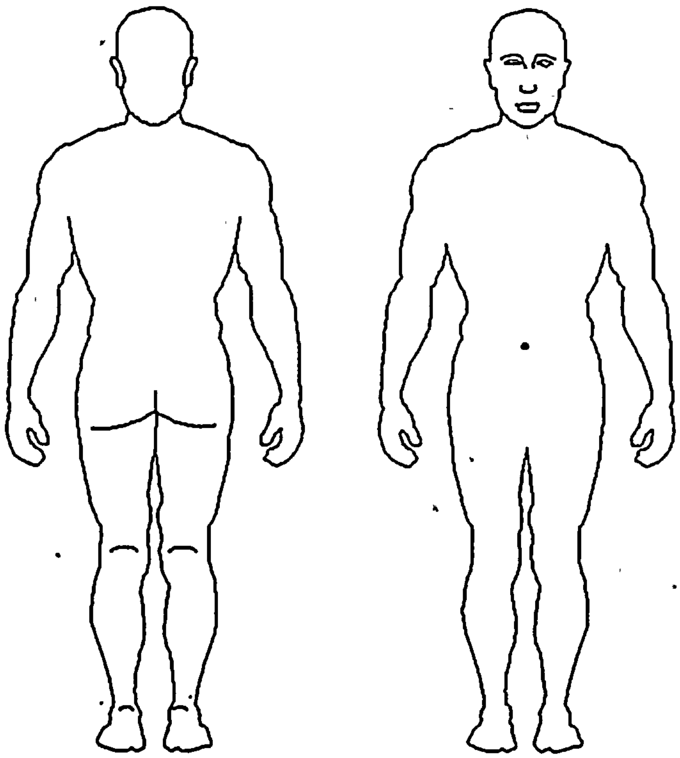


Monitor Name:		Date:	Time:
Vehicle Reg:	Owner:	Address:	
City:	State: ZIP:	Telephone:	
CONTAMINATION			
Location Outside Vehicle (describe):			
Location Inside Vehicle (describe):			
Location in Engine Compartment (describe):			
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*			
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*			
Vehicle Impounded YES NO	*Item(s) Impounded:*		

2.36 Form EP-0502, Individual Body Decontamination (sample)

FORM EP-0502A **PVNGS EMERGENCY PLANNING**

INDIVIDUAL BODY DECONTAMINATION



Monitor Name:	Date:	Time:
Patient Name:	Address:	
City: State:	ZIP:	Telephone:
CONTAMINATION		
Location on Clothing (describe):		
Location on Body (describe):		
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*		
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*		
Item(s) Impounded:		

2.37 Form EP-0503, KI Distribution (sample)

FORM EP-0503A **PVNGS EMERGENCY PLANNING**

KI DISTRIBUTION

Name:	SSN:	Work Group:
Reason For Dispensation:		

DISPENSATION DATA

Date:	Time:	Milligrams:

EC APPROVED (*circle one*): Y N ______________________ *(ADMINISTERING INDIVIDUAL SIGNATURE)*

WORKER: I have reviewed the information below, I am aware of the potential health hazards involved with KI usage, and my usage hereunder is voluntary:

______________________ *(SIGNATURE)*

Potassium Iodide *(KI)*, a stable Iodine, may be used in the event of a radiological emergency as a blocking agent to prevent the uptake of radioactive Iodine by the thyroid gland, which depends upon Iodine for the synthesis of thyroid hormones. Iodine is normally supplied to the thyroid gland through dietary intake. However, the thyroid is capable of absorbing and storing only a limited amount of Iodine. Excess amounts ingested are eliminated by urination. Therefore, the use of stable Iodine will limit thyroid exposure by blocking the uptake of radioiodine by the thyroid, leading to elimination of radioactive Iodine from the body.

The use of Potassium Iodide does present some risk to the user in the form of side effects, allergic reactions, or other contraindications. Allergic reactions leading to severe illness may occur for individuals with unusual sensitivity to Iodine or those with pre-existing thyroid disease. Such reactions may include enlargement of the thyroid *(possibly leading to respiratory impairment)*, alterations in body metabolism due to increasing or decreasing thyroidal hormone output, and hypersensitive reactions such as fever, pain in joints, and alteration of blood cell counts. These effects are usually associated with Iodine doses much higher and administered over a longer duration of time than those allowed to be administered by PVNGS Station procedures. Possible side effects include skin rash, swelling of the salivary glands, and Iodism *(metallic taste, burning mouth and throat, sore teeth and gums, head cold symptoms, upset stomach, and possible diarrhea)*. Allergic reactions to low doses are usually limited to angioedema *(swelling or hives)*.

The above represents the extreme. The sensitivity of the average individual to Potassium Iodide at the levels administered is minimal. A good rule is that if no history exists for sensitivity to medication in general nor any for reactions to seafood or shellfish, then there should be no reaction to 130 mg of Potassium Iodide administered as one tablet once per day.

Potassium Iodide may be taken along with other medications prescribed for thyroid problems *(e.g., thyroid hormone, antithyroid medications)*. Pregnant and nursing women, babies, and children may also take this drug. Additional questions may be clarified by reading Appendices B and C of EPA-400, available at Emergency Planning. Although the Food and Drug Administration has endorsed the use of Potassium Iodide, the risks associated with low dosages of Potassium Iodide for thyroid blocking in a radiation emergency may outweigh the risks associated with radioiodine induced thyroid nodules or cancer. For this reason, THE USE OF POTASSIUM IODIDE BY EMERGENCY WORKERS SHALL BE ON A VOLUNTARY BASIS.

Potassium Iodide may only be authorized by the Emergency Coordinator for use by volunteers when the projected Thyroid CDE dose is 25 REM or greater. Emergency workers may be APS or non-APS employees at the facility. Under emergency conditions, volunteer approvals and briefings may be obtained or performed locally and telecommunicated to expedite the response. Follow-up monitoring of all individuals issued Potassium Iodide must be performed in cases where actual exposure to radioactive Iodine did occur. This is necessary to maintain the thyroid blocking action by additional Potassium Iodide doses until the Iodine activity decays. Follow-up monitoring of all individuals issued Potassium Iodide must also be performed in all cases for possible side effects from the Potassium Iodide.

FOLLOW-UP DATA

Was individual actually exposed to radioactive Iodine? Y N

If *Y(es)*, furnish additional information regarding subsequent KI administration, air sample data, Whole Body count data, and any other information appropriate to determination of actual Thyroid CDE:

Reviewed by: ______________________ Title: ______________________

2.38 Form EP-0511, Core Exit Thermocouple CDA, page 1 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

CORE EXIT THERMOCOUPLE CDA

DATE:	TIME:	UNIT:	CYCLE:
1) MAXIMUM CET TEMPERATURE			
Date of temperature reading:		Maximum CET Temperature:	
Time of temperature reading:		Reactor Vessel Pressure:	
2) FUEL RODS RUPTURED (%)			
Using the Reactor Vessel Pressure *(from above)* and the Maximum CET Temperature *(from above)*, determine the percent of fuel rods ruptured using Core Damage Assessment, Figure 1 *(attached)*. Percent of Fuel Rods Ruptured *(from Figure 1)*: ________			
3) USNRC CATEGORY OF FUEL DAMAGE			
NOTES: The Core Exit Thermocouple methodology yields damage estimates in Categories 1, 2, 3, and 4. The result recorded above is likely a lower limit estimate. The Noteworthy Items from 16IG-0EP031, Core Damage Assessment, Section 1, Introduction, should be read and understood prior to making a determination. Using the percent of fuel rods ruptured, the Clad Damage Characteristics from Core Damage Assessment, and engineering judgment, determine the USNRC Category of Fuel Damage. USNRC Category of Fuel Damage: ________			
4) RECORD			
Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.			
5) COMMENTS			

2.39 Form EP-0511, Core Exit Thermocouple CDA, page 2 of 2 (sample)

FORM EP-0511 B **PVNGS EMERGENCY PLANNING**

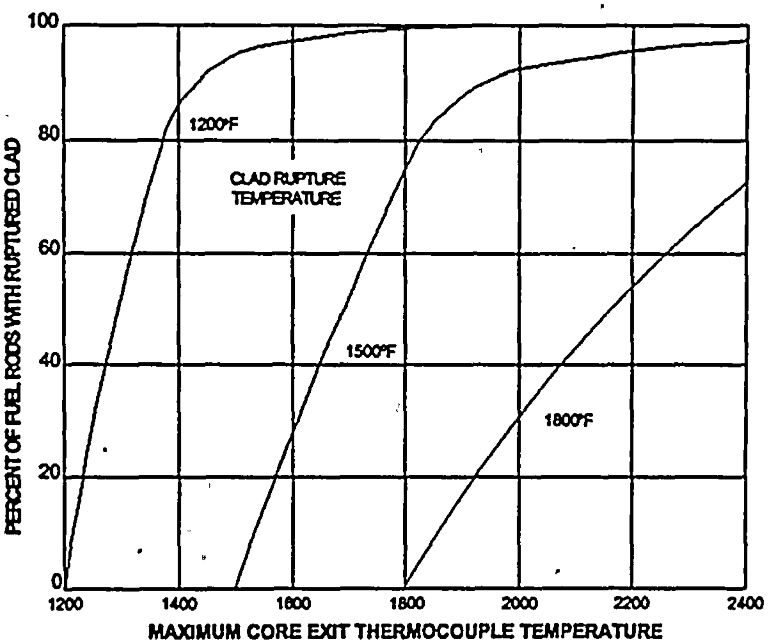
CORE EXIT THERMOCOUPLE CDA

NOTE

Figure taken from Core Damage Assessment, Figure 1

FIGURE 1

PERCENT OF FUEL RODS WITH RUPTURED CLAD vs MAXIMUM CORE EXIT THERMOCOUPLE TEMPERATURE



When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

2.40 Form EP-0512, Containment RMS CDA, page 1 of 3 (sample)

FORM EP-0512B PVNGS EMERGENCY PLANNING

CONTAINMENT RMS CDA (Part 1 of 2)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) PLANT POWER CORRECTION

If reactor power has not been steady over the 30 days prior to reactor shutdown, engineering judgment is required to determine the most representative power level to be used.

This judgment should consider the following guidelines:

- The average power during the 30 days is not necessarily the most representative value.
- The power levels at which the reactor last operated should weigh more heavily than earlier power levels.
- Continued operation at one power level should weigh more heavily than brief transient levels.
- In the case in which the reactor has produced power for less than 30 days, the estimate of core damage obtained could under-predict the actual conditions.

Record the prior 30-day power history:

POWER *(%)*	DURATION *(days)*

Using engineering judgment, determine the most representative power to be used in the power correction factor and record below:

Representative Power: ________ %

100 / Representative Power = Power Correction Factor *(PCF)*

100 / Representative Power = ________ *(PCF)*

3) DOSE RATE CORRECTION

Record the dose rates of each Containment radiation monitor and, using the Power Correction Factor *(PCF)* calculated in Step 2 *(above)*, calculate a corrected dose rate for each radiation monitor.

NOTES: RU Monitors read in REM / hour. In this case, REM / hour is equivalent to RAD / hour.
RU-148 and RU-149 are the Containment HI-Range monitors located at elevation 140' in Containment.

MONITOR ID	DATE / TIME	HRS SINCE SHUTDOWN	DOSE RATE *(RADS/HR)*	CORRECTED DOSE RATE *(DOSE RATE x PCF)*
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				
RU-148				
RU-149				

2.41 Form EP-0512, Containment RMS CDA, page 2 of 3 (sample)

FORM EP-0512 B **PVNGS EMERGENCY PLANNING**

CONTAINMENT RMS CDA (Part 2 of 2)

DATE:	TIME:	UNIT:	CYCLE:

4) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Radiation Monitors methodology yields damage estimates in Categones 2 through 7 only.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using Core Damage Assessment, Figure 2 *(attached)*, the time since reactor shutdown, the corrected dose rates, engineering judgment, and the Dose Rate Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

MONITOR ID	USNRC CATEGORY OF FUEL DAMAGE
RU-148	
RU-149	

5) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

6) COMMENTS

2.42 Form EP-0512, Containment RMS CDA, page 3 of 3 (sample)

FORM EP-0512B **PVNGS EMERGENCY PLANNING**

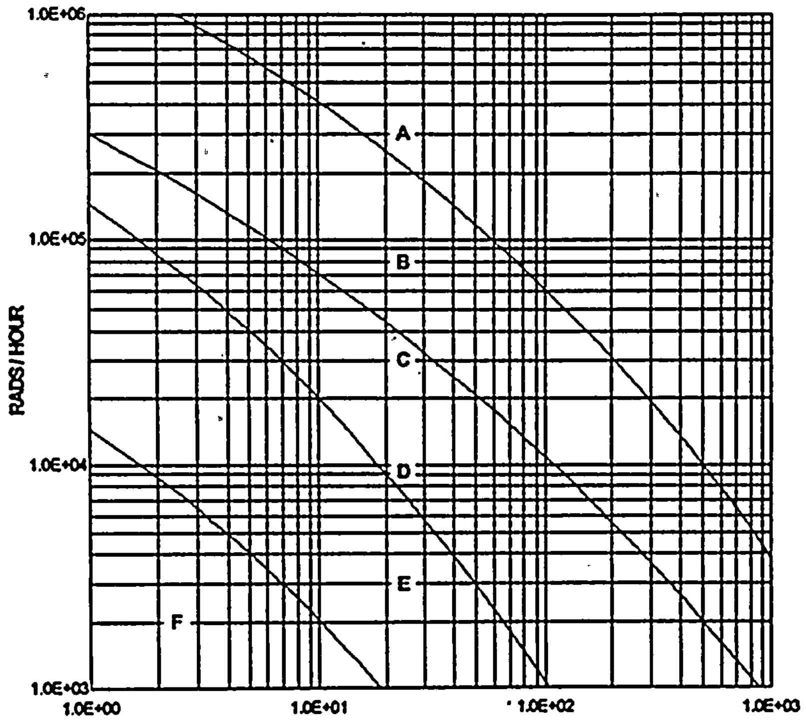
CONTAINMENT RMS CDA

NOTE

Figure taken from Core Damage Assessment, Figure 2

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL



A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

2.43 Form EP-0513, Containment Hydrogen CDA, page 1 of 5 (sample)

FORM EP-0513A PVNGS EMERGENCY PLANNING

CONTAINMENT HYDROGEN CDA (Part 1 of 5)

DATE:	TIME:	UNIT:	CYCLE:

NOTE: All figures referenced denote those contained in Core Damage Assessment, Figures.

1) CORE UNCOVERING ESTIMATES

INSTRUMENT	ESTIMATED CORE UNCOVERING TIME	ESTIMATED CORE RECOVERY TIME
Reactor Vessel Level Monitoring System	Lower Limit Elevation Uncovers Time: ________	Lower Limit Elevation Recovers Time: ________
Core Exit Thermocouple Temperature	Start of Continuous Rise or Exceed 660°F Time: ________ Temperature: ________	Rapid Temperature Drop to Saturation Time: ________ Temperature: ________
Core Exit Thermocouple Saturation Margin	Start of Superheat *(Use Figure 3)* Time: ________	Return to Saturation or Subcooling Time: ________

2) BEST ESTIMATE

Record the best estimate of core uncovering / recovery times and corresponding system pressure. The pressure recorded for core uncovering will be used in Step 10 in conjunction with Figure 8.

Core Uncovering:	Time: ________	Pressure: ________
Core Recovery:	Time: ________	Pressure: ________

3) INLET FLOW RATE

Record the approximate vessel inlet flow rates *(GPM)* during the core uncovering heatup period until the time of peak Core Exit Thermocouple *(CET)* temperature is reached.

HPSI Flow Rate: ________	LPSI Flow Rate: ________
Charging Flow Rate: ________	Other Inlet Flows: ________

4) SAMPLES

Obtain an RCS liquid sample and a Containment atmosphere sample *(online H_2 Monitor can be used)* in accordance with 74OP-xSS02 and record the values for the parameters listed below.

NOTE: At least 2 hours is expected between PASS sample request and sample results. It will not be possible to obtain many samples at the same time.

RCS Conditions	Containment Conditions
Sample: Date: ________ Time: ________	Sample: Date: ________ Time: ________
System Pressure: ________ psia	Containment Pressure: ________ psig
Temperature: ________ °F	Temperature: ________ °F
Reactor Vessel Level: ________ %	Hydrogen Concentration: ________ volume %
Pressurizer Level: ________ %	--
Hydrogen Concentration: ________ cc/kg @ STP	--

2.44 Form EP-0513, Containment Hydrogen CDA, page 2 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 2 of 5)

DATE:	TIME:	UNIT:	CYCLE:

5) HYDROGEN SAMPLE DATA REDUCTION

HYDROGEN MEASURED IN CONTAINMENT

$$\text{Containment Hydrogen}\ (\textit{total SCF}) = \frac{H_2}{100} \times 2.6E{+}06 \times \frac{(P_C + 14.7)}{14.7} \times \frac{492}{(T_C + 460)}$$

$$= \_\_\_\_ \times 2.6E{+}06 \times \_\_\_\_\_\_ \times \_\_\_\_\_\_ = \_\_\_\_\_\_\ \text{SCF}$$

Where:

H_2	=	Hydrogen concentration *(volume %)* as measured on Gas Chromatograph *(from Step 4 or H_2 Monitor)*
100	=	Conversion from percent to decimal fraction
2.6E+06	=	Containment volume in cubic feet
P_C	=	Containment pressure in psig *(from Step 4)*
T_C	=	Containment temperature in °F *(from Step 4)*
460	=	Conversion from °F to °R
492	=	Standard temperature in °R
14.7	=	Standard pressure in psia
SCF	=	Standard Cubic Feet

HYDROGEN MEASURED IN RCS

$$\text{RCS Hydrogen}\ (\textit{total SCF}) = [H_2] \times V_{RCS} \times DCF \times 3.531E{-}05 \times 1.0E{-}03$$

$$= \_\_\_\_ \times \_\_\_\_ \times \_\_\_\_ \times 3.531E{-}05 \times 1.0E{-}03 = \_\_\_\_\ ft^3$$

Where:

H_2	=	Hydrogen concentration in cc/kg @ STP *(from Step 4)*
V_{RCS}	=	RCS volume in cc *(from Figure 4)*
DCF	=	Density Correction Factor in g/cc *(from Figure 5)*
3.531E-05	=	Conversion factor *(ft^3/cc)*
1.0E-03	=	Conversion factor *(kg/g)*

TOTAL MEASURED HYDROGEN

Containment Hydrogen + RCS Hydrogen = Total Hydrogen *(SCF)* = __________ SCF

2.45 Form EP-0513, Containment Hydrogen CDA, page 3 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 3 of 5)

DATE:	TIME:	UNIT:	CYCLE:

6) HYDROGEN CORRECTION FOR OXIDATION

The total measured Hydrogen calculated in Step 5 includes Hydrogen generated from the oxidation of materials within Containment, as well as Hydrogen generated from the radiolysis of water. The Hydrogen produced from these two processes will be calculated in Steps 6 and 7 and subtracted from the total Hydrogen calculated in Step 5.

Record the Containment temperature at selected time intervals *(up until the time the Containment sample was obtained)* and calculate the Hydrogen generated by oxidation of materials within Containment using Figure 6.

NOTE: An attempt should be made to select the time intervals such that the change in Containment temperature is not greater than 20°F.

Time at Start of Interval	Interval Duration (hours)	Average Containment Temperature During Interval (°F)	H_2 Production Rate (SCF/hr) from Figure 6	H_2 Produced (SCF) = Interval X Production Rate
Accident Start	--------------	--------------	--------------	--------------

Total Hydrogen Production *(SCF)* ∗ = __________ SCF

∗ The maximum value for PVNGS is 200,271 SCF. If a higher value is obtained from the calculation, enter 200,271 SCF in the space provided.

2.46 Form EP-0513, Containment Hydrogen CDA, page 4 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 4 of 5)

DATE:	TIME:	UNIT:	CYCLE:

7) HYDROGEN CORRECTION FOR RADIOLYSIS

Determine the amount of Hydrogen produced from the radiolysis of water using the following power, decay times, and Figure 7:

Reactor Power at Time of Shutdown *(for constant power conditions)*: __________

Representative Power *(RP) - (from Form EP-0512, Step 2)*: __________

Estimated MWT = Full Power MWT X RP = 3800 X __________ = __________ MWT

Reactor Shutdown Date: __________ Reactor Shutdown Time: __________

Sample Date: __________ Sample Time: __________

Time from Shutdown to Sample: __________ hours

Using Figure 7, determine the specific Hydrogen production rate *(SCF/MWT)* by radiolysis for the sample time. Obtain a value from each curve, multiply by the estimated MWT, and record total H_2 produced by radiolysis.

Limit Curve	H_2 Produced *(SCF/MWT)*	Operating Power *(MWT)*	Total H_2 produced *(SCF)*
UPPER:	__________ X	__________ =	__________
LOWER:	__________ X	__________ =	__________

Once obtained, use the results of the radiochemistry damage assessment *(Form EP-0514)* to estimate which results should be used: the Upper Limit for major fuel pellet overheat, the Lower Limit for initial fuel pellet overheat, or the appropriate estimate between the two curves for intermediate fuel overheat.

8) TOTAL HYDROGEN PRODUCED FROM CORE CLAD

Total H_2 Measured *(from Total Measured Hydrogen in Step 5)*: __________ SCF

H_2 Production from Containment Materials *(from Step 6)*: __________ SCF

H_2 Production from Radiolysis *(from Step 7)*: __________ SCF

Total H_2 from Core Clad Oxidation = *(Step 5 - [Step 6 + Step 7])* = __________ SCF

9) PERCENT OF CLAD OXIDIZED

$$\text{\% Clad Oxidized} = \frac{\text{Total } H_2 \text{ from Clad Oxidation}}{5.65E{+}03 \text{ SCF}} = \frac{\_\_\_\_\_\_}{5.65E{+}03} = \_\_\_\_\_\_ \%$$

2.47 Form EP-0513, Containment Hydrogen CDA, page 5 of 5 (sample)

FORM EP-0513A **PVNGS EMERGENCY PLANNING**

CONTAINMENT HYDROGEN CDA (Part 5 of 5)

DATE:	TIME:	UNIT:	CYCLE:

10) PERCENT OF RUPTURED FUEL RODS

Using the percent of clad oxidized *(Step 9)*, the pressure during core uncovering *(Step 2)*, and Figure 8, determine the percent of ruptured fuel rods.

Estimated % Ruptured Fuel Rods *(from Figure 8)*: __________ %

11) PERCENT OF EMBRITTLED FUEL RODS

Using the percent of clad oxidized *(Step 9)* and Figure 9, determine the percent of embrittled fuel rods.

Estimated % Embrittled Fuel Rods *(from Figure 9)*:

RANGE: Upper: __________ % Lower: __________ %

12) USNRC CATEGORY OF FUEL DAMAGE

NOTES: The Containment Hydrogen methodology yields damage estimates in Categories 3, 4, 5, 6, or 7.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Using the estimates of the percent of fuel rods ruptured, the percent of fuel rods embrittled *(damaged)*, and the Clad Damage Characteristics from Core Damage Assessment, determine the USNRC Category of Fuel Damage.

USNRC Category*(ies)* of Fuel Damage: __________

13) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

14) COMMENTS

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2.48 Form EP-0514, Containment Radiochemistry CDA, page 1 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 1 of 11)

DATE:	TIME:	UNIT:	CYCLE:

1) REACTOR SHUTDOWN DATA

Date of reactor shutdown:	Time of reactor shutdown:

2) SAMPLE LOCATIONS

NOTE: During certain small break LOCA events, it will not be possible for PASS to obtain a sample representative of the Containment sump until after a RAS occurs. This could be 14+ hours after the accident. Refer to Core Damage Assessment, Introduction, Noteworthy Items, for guidance without a Containment sump sample.

Determine the most appropriate sample locations for assessment using Figure 10 in Core Damage Assessment.

3) SAMPLING

Obtain radiochemistry samples and sample results from the appropriate sample locations as determined in Step 2, above.

4) SAMPLE DATA

Record the following data at the time each sample was obtained:

	REACTOR COOLANT SYSTEM	CONTAINMENT ATMOSPHERE	CONTAINMENT SUMP
Sample Date			
Sample Time			
Sample Number			
Pressure *(psig)*	--------------		--------------
Temperature *(°F)*			--------------
RCS Level *(RVLMS)* at Sample Time *(%)*		--------------	--------------
Containment Volume *(cc)*	--------------	7.36E+10	--------------
Containment Water Level *(6-150 inches)*	--------------	--------------	

2.49 Form EP-0514, Containment Radiochemistry CDA, page 2 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 2 of 11)

DATE:	TIME:	UNIT:	CYCLE:

5) RCS VOLUME

Determine the RCS volume at the time of the sample using RVLMS and Figure 4 in Core Damage Assessment, or by using ERFDADS Point ID #SPDS0260.

___ HJTC Uncovered = ___________ cc *(if using Figure 4 and RVLMS)*

SPDS0260 = ___________ gallons X 3.785412E+03 = ___________ cc *(if using SPDS0260)*

6) CONTAINMENT WATER VOLUME

NOTE: If Containment water level is not available, Containment water volume must be estimated from RWT, RCS, and SIT volumetric contributions.

Determine the Containment water volume at the time of the sample using Containment water level *(from Step 4)* and Figure 11 in Core Damage Assessment.

Containment Volume = ___________ cc

2.50 Form EP-0514, Containment Radiochemistry CDA, page 3 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 3 of 11)

DATE:	TIME:	UNIT:	CYCLE:

7) RCS SAMPLE ACTIVITY CORRECTION

Record the activity of the RCS sample and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

RCS Activity = Decay Corrected Activity *(from above)* X ρ X RCS_{VOL} X 1.0E-06

Where:

ρ = Water density correction factor *(see Figure 5 of Core Damage Assessment)*
RCS_{VOL} = RCS water volume *(from Step 5)*
1.0E-06 = Conversion from µCi to Ci

Record ρ and t: ρ = ____________ t = ____________

Date of Reactor Shutdown: ____________ Date of RCS Sample: ____________

Time of Reactor Shutdown: ____________ Time of RCS Sample: ____________

TABLE 1: RCS SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*RCS Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{90}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.51 Form EP-0514, Containment Radiochemistry CDA, page 4 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 4 of 11)

DATE:	TIME:	UNIT:	CYCLE:

8) CONTAINMENT SUMP SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Sump sample if obtained and correct the activity for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*
t = Time since reactor shutdown *(seconds)* at time of sample

Containment Sump Activity = Decay Corrected Activity *(from above)* X Containment Sump Volume X 1.0E-06

Where:

Containment Sump Volume = Containment Sump Volume *(from Step 6)*
1.0E-06 = Conversion from µCi to Ci

Record t: t = ______________

Date of Reactor Shutdown: ______________ Date of Contain. Sump Sample: ______________

Time of Reactor Shutdown: ______________ Time of Contain. Sump Sample: ______________

TABLE 2: CONTAINMENT SUMP SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Sample Activity (µCi/cc)*	*Decay Corrected Activity (µCi/cc)*	*Containment Sump Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.52 Form EP-0514, Containment Radiochemistry CDA, page 5 of 11 (sample)

FORM EP-0514A PVNGS EMERGENCY PLANNING

CONTAINMENT RADIOCHEMISTRY CDA (Part 5 of 11)

DATE:	TIME:	UNIT:	CYCLE:

9) CONTAINMENT ATMOSPHERE SAMPLE ACTIVITY CORRECTION

Record the activity of the Containment Atmosphere sample if obtained and correct the activity for Standard Temperature and Pressure *(STP)* and for decay.

Decay Corrected Activity = Activity of Sample / $(e^{-\lambda t})$

Where:

λ = Decay constant *(seconds^{-1})*

t = Time since reactor shutdown *(seconds)* at time of sample

Containment Atmosphere Activity = Decay Corrected Activity *(from above)* X $[(P_1 + 14.7) / 14.7]$ X $[492 / (T_1 + 460)]$ X (7.36E+10) X 1.0E-06

Where:

P_1 = Containment pressure at time of sample *(psig)*

T_1 = Containment temperature at time of sample *(°F)*

7.36E+10 = Containment atmosphere volume *(cc)*

1.0E-06 = Conversion from µCi to Ci

Record t, P_1, and T_1: t = ________ P_1 = ________ psig T_1 = ________ °F

Date of Reactor Shutdown: ________ Date of Contain. Atmos. Sample: ________

Time of Reactor Shutdown: ________ Time of Contain. Atmos. Sample: ________

TABLE 3: CONTAINMENT ATMOSPHERE SAMPLE

Isotope	*Decay Constant (sec^{-1})*	*Specific Sample Activity (µCi/cc)*	*Decay Corrected Specific Activity (µCi/cc)*	*Containment Atmosphere Activity (Ci)*
Kr^{87}	1.5E-04			
Xe^{131m}	6.7E-07			
Xe^{133}	1.5E-06			
I^{131}	9.9E-07			
I^{132}	8.4E-05			
I^{133}	9.3E-06			
I^{135}	2.9E-05			
Cs^{134}	1.1E-08			
Rb^{88}	6.5E-04			
Te^{129}	1.7E-04			
Te^{132}	2.5E-06			
Sr^{89}	1.6E-07			
Ba^{140}	6.3E-07			
La^{140}	4.8E-06			
La^{142}	1.2E-04			
Pr^{144}	6.7E-04			

2.53 Form EP-0514, Containment Radiochemistry CDA, page 6 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 6 of 11)

DATE:	TIME:	UNIT:	CYCLE:

10) IODINE / NOBLE GAS RATIOS

Calculate the following ratios for each Noble Gas and Iodine isotope using the decay corrected specific activities obtained in Steps 7, 8, and 9:

Noble Gas Ratio = Noble Gas Isotope Activity / Xenon ^{133} Activity

Iodine Ratio = Iodine Isotope Activity / Iodine ^{131} Activity

Isotope	*RCS Activity (Ci)*	*RCS Ratio*	*Containment Sump Activity (Ci)*	*Containment Sump Ratio*	*Containment Atmosphere Activity (Ci)*	*Containment Atmosphere Ratio*
Kr^{87}						
Xe^{131m}						
Xe^{133}		1.0		1.0		1.0
I^{131}		1.0		1.0		1.0
I^{132}						
I^{133}						
I^{135}						

11) SOURCE OF RELEASE

Determine the source of release by comparing the ratios calculated in Step 10 *(above)* to the predicted ratios provided below:

Isotope	*Activity Ratio in Fuel Pellet Inventory*	*Activity Ratio in Gap Inventory*
Kr^{87}	0.200	< 0.001
Xe^{131m}	0.003	0.001 - 0.003
I^{132}	1.400	0.010 - 0.050
I^{133}	2.000	0.500 - 1.000
I^{135}	1.800	0.100 - 0.500

<u>NOTE</u>: Within the accuracy of included calculations, it is appropriate to select as a source that ratio which is closest to the value obtained in Step 10.

Source of Release: ______________________

2.54 Form EP-0514, Containment Radiochemistry CDA, page 7 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 7 of 11)

DATE:	TIME:	UNIT:	CYCLE:

12) SOURCE INVENTORY

Each isotope has an equilibrium inventory. However, these equilibrium source inventories must be corrected for the plant power history if the reactor has not been operating continually at 100% power.

The isotopes are divided into 2 groups based on their respective half-lives. Group 1 isotopes are to be used if reactor power has not changed by greater than ± 10% in the last 30 days prior to the accident. Group 2 isotopes are used if reactor power has not changed by greater than ± 10% in the last 4 days prior to the accident.

The following equations can be used to determine the Power Correction Factor *(PCF)* for the respective isotopic group if the previously mentioned criteria is satisfied.

Group 1 PCF = Steady State Power Level for the prior 30 Days / 100

Group 2 PCF = Steady State Power Level for the prior 4 Days / 100

If the reactor has not operated at a constant power level prior to shutdown, the following equation is used *(use a 30-day power history)*:

<u>NOTE</u>: Use only the prior 30-day power history for the equation below.

$$PCF = {}_j P_j \left(1 - e^{-t_j}\right) e^{-t_j}$$

Where:

P_j = Fraction of rated reactor power in period $_j$

t_j = Duration of period $_j$

t_j = Time from the end of period $_j$ to reactor shutdown *(seconds)*

= Decay constant *(seconds* $^{-1}$*)*

continues...

2.55 Form EP-0514, Containment Radiochemistry CDA, page 8 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 8 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***12) SOURCE INVENTORY** continued...*

Using the appropriate equation, calculate the Power Correction Factor for each isotope and the corrected source inventory. Record the results in the tables below.

NOTE: The Equilibrium Source Inventories listed below are the maximum peak inventories for a reactor core operating with 5% enriched U^{235} at 3990 MWT. The actual core inventory will most likely be slightly lower than the inventories given.

GAS GAP INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		1.54E+01	
Xe^{131m}	1	6.7E-07		1.09E+05	
Xe^{133}	1	1.5E-06		1.91E+07	
I^{131}	1	9.9E-07		9.84E+06	
I^{132}	2	8.4E-05		1.14E+04	
I^{133}	2	9.3E-06		1.06E+07	
I^{135}	2	2.9E-05		1.76E+06	

FUEL PELLET INVENTORY

Isotope	*Group*	*Decay Constant (seconds $^{-1}$)*	*Power Correction Factor*	*Equilibrium Source Inventory (Ci)*	*Corrected Source Inventory (Ci)*
Kr^{87}	2	1.5E-04		7.57E+07	
Xe^{131m}	1	6.7E-07		1.20E+06	
Xe^{133}	1	1.5E-06		2.12E+08	
I^{131}	1	9.9E-07		1.07E+08	
I^{132}	2	8.4E-05		1.55E+08	
I^{133}	2	9.3E-06		2.23E+08	
I^{135}	2	2.9E-05		2.09E+08	
Cs^{134}	1	1.1E-08	1.00	2.22E+07	
Rb^{88}	2	6.5E-04		1.08E+08	
Te^{129}	2	1.7E-04		3.34E+07	
Te^{132}	1	2.5E-06		1.52E+08	
Sr^{89}	1	1.6E-07		1.32E+08	
Ba^{140}	1	6.3E-07		1.98E+08	
La^{140}	1	4.8E-06		2.11E+08	
La^{142}	2	1.2E-04		1.87E+08	
Pr^{144}	2	6.7E-04		1.67E+08	

2.56 Form EP-0514, Containment Radiochemistry CDA, page 9 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 9 of 11)

DATE:	TIME:	UNIT:	CYCLE:

13) INVENTORY PERCENT

Calculate the percent of the corrected source inventory present for each isotope and record the results in the tables below.

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF GAS GAP INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			

continues...

2.57 Form EP-0514, Containment Radiochemistry CDA, page 10 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 10 of 11)

DATE:	TIME:	UNIT:	CYCLE:

***13) INVENTORY PERCENT** continued...*

Total Activity = Sum of RCS activity *(from Step 7)*, Containment Sump activity *(from Step 8)*, and Containment Atmosphere activity *(from Step 9)* for each respective isotope

% Isotope Present = 100 X Total Activity / Corrected Source Inventory

% OF FUEL PELLET INVENTORY PRESENT

Isotope	*Total Activity (Step 7 + Step 8 + Step 9)*	*Corrected Source Inventory*	*% of Source Inventory Present*
Kr^{87}			
Xe^{131m}			
Xe^{133}			
I^{131}			
I^{132}			
I^{133}			
I^{135}			
Cs^{134}			
Rb^{88}			
Te^{129}			
Te^{132}			
Sr^{89}			
Ba^{140}			
La^{140}			
La^{142}			
Pr^{144}			

2.58 Form EP-0514, Containment Radiochemistry CDA, page 11 of 11 (sample)

FORM EP-0514A **PVNGS EMERGENCY PLANNING**

CONTAINMENT RADIOCHEMISTRY CDA (Part 11 of 11)

DATE:	TIME:	UNIT:	CYCLE:

14) USNRC CATEGORY OF FUEL DAMAGE

NOTES: Engineering judgment is used to compare the previous parameters with the 10 USNRC Categories of Fuel Damage in Core Damage Assessment, Fuel Damage Categories. Core damage is not anticipated to occur uniformly. It is anticipated that the included calculations will yield a combination of 1 or more categories which exist simultaneously.

Samples are likely to have been collected at different times.

The Noteworthy Items from Core Damage Assessment, Introduction, should be read and understood prior to making a determination.

Determine the USNRC Category of Fuel Damage using the Radiological Characteristics from Core Damage Assessment, and the following criteria:

1. Identification of the isotopes which most characterize a given sample *(see Steps 7, 8, and 9)*.
2. Identification of the source of the release *(see Step 11)*.
3. Percent of source inventory for each isotope present *(see Step 13)*.

USNRC Category*(ies)* of Fuel Damage: __________

15) RECORD

Log all biases considered in determination of the category of fuel damage on Form EP-0012, Emergency Action Log.

16) COMMENTS

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PV216-08NI (8-88)

2.59 Form EP-0541, Palo Verde NAN Emergency Message (sample)

FORM EP-0541 c **PVNGS EMERGENCY PLANNING**

PALO VERDE NAN EMERGENCY MESSAGE FORM

① *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

② This NAN call was initiated at: ____________ *(time)*

③ This is Palo Verde Nuclear Generating Station Notification of

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY
ALERT GENERAL EMERGENCY

declared in Unit ______ at ____________ *(time)* on ____________ *(date)*

PVNGS Emergency Status Code*(s)* ____________

④ The wind speed is ____________ MPH from ____________ Degrees
(35' elev - 15 min avg) *(35' elev - 15 min avg)*

Authenticator Code: ____________

This is ____________ *(name)* : STSC Comm Gov't Liaison *(circle one)*

at U1 STSC U2 STSC U3 STSC EOF *(Circle ERO facility)*

⑤ THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ____________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ____________
- ☐ Other ____________

⑥ *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

____________ *(EC / EOD Signature)*

____________ *(Date)* *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-256-1011			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-223-2000			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-255-4845			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-244-0504			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-273-1411			
USNRC Headquarters *(STA will call)*	301-816-5100	301-951-0550			

⑦ GROUP PAGER: *(Read Message)*: "This Is / Is not a drill. This is PVNGS Unit ____ Classification ____________ Please respond appropriately." *(repeat message once)*

Group Paging System #1 *(read message above)*	EMER #1 *(pager 1611)*	Normal phone *(pager 7600-1611)*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager 1677)*	Normal phone *(pager 7600-1677)*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager 1633)*	Normal phone *(pager 7600-1633)*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	81-1080 81-1081 or 9-602-250-1070			

F_EP0541.DOC 09/09/99 09:25:21

2.60 Form EP-0542, Followup Emergency Message, page 1 of 2 (sample)

FORM EP-0542A PVNGS EMERGENCY PLANNING

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 1 of 2)*

1 *(check one)* ☐ - THIS IS A DRILL ☐ - THIS IS NOT A DRILL

Message Number: ____________________
(ARRA use only)

THIS IS A PALO VERDE NUCLEAR GENERATING STATION FOLLOW-UP INFORMATION MESSAGE CONCERNING THE *(circle one)*
UNUSUAL EVENT - ALERT - SITE AREA EMERGENCY - GENERAL EMERGENCY declared in Unit ___ at ________ *(time)* MST on ________ *(date)*

PVNGS EMERGENCY STATUS CODE(S) for Emergency stated above __________

2 THIS IS ____________ *(name)* ____________ *(ERO title)* at ____________ *(facility)*

3 EMERGENCY stated above was *(check one)*

☐ - UPGRADED to ____________ at ________ MST on ________
☐ - CONTINUES
☐ - DOWNGRADED to ____________ at ________ MST on ________
☐ - TERMINATED at ____________ MST on ________

4 PROTECTIVE ACTION RECOMMENDATION(S) *(check appropriately)*

☐ - NONE
☐ - NO CHANGE SINCE LAST PAR
☐ - EVACUATE ____________
☐ - SHELTER ____________
☐ - OTHER ____________

If the Emergency was terminated, go to item 14 after completing items 1-4 (otherwise, continue to item 5).
If items 5-13 have not changed from previous Follow-up transmission, write "NC" by those that apply.

5 EMERGENCY DESCRIPTION / REMARKS

____
____
____
____

6 PVNGS FIELD ACTIVITIES

☐ - RFAT dispatched
☐ - Site Evacuation

7 REACTOR STATUS *(check one)*

☐ - Tripped at ________ MST on ________
☐ - Critical at ____ % thermal power
☐ - Shutdown in progress

2.61 Form EP-0542, Followup Emergency Message, page 2 of 2 (sample)

FORM EP-0542A PVNGS EMERGENCY PLANNING

FOLLOW-UP EMERGENCY MESSAGE FORM *(part 2 of 2)*

Message Number: ____________ *(ARRA use only)*

8 GASEOUS RELEASES *(check one)*

☐ - Within Technical Specifications ☐ - Were above Technical Specifications
☐ - Above Technical Specifications ☐ - Potentially above Technical Specifications

Point of Release ____________ Estimated Duration ____________ Started at ________ MST on ________

Last Significant Change at ________ MST on ________ Release stopped at ________ MST on ________

Iodines ________ μCi/sec Noble Gases ________ μCi/sec Iodine / Noble Gas ________ *(ARRA use only)*

Effluent flow rate ______ cfm x 472 = ____________ *(ARRA use only)* cc/sec

9 METEOROLOGICAL DATA

Wind is from ________ *(35' elev - 15-min avg)* Degrees at ________ *(35" elev - 15-min avg)* MPH Stability Class ________ Precipitation *(circle one)* YES NO

10 PLUME ARRIVAL TIME AT *(enter time or "N/A" if not applicable)*

Ruth Fisher School ________ MST Arlington School ________ MST

11 THE FOLLOWING ACTIONS ARE UNDERWAY ____________

12 WE REQUEST THE FOLLOWING ONSITE SUPPORT / ASSISTANCE FROM OFFSITE SOURCES

____

13 OUR PROGNOSIS IS that conditions
☐ - Are under control
☐ - Can be expected to terminate within ______ hours
☐ - Are worsening

14 *(check one)*
☐ - THIS IS A DRILL
☐ - THIS IS NOT A DRILL

APPROVAL:

____
Emergency Coordinator (EC)
-- or --
Emergency Operations Director (EOD)

____
Date *Time*

PV216-04N (8-84)

PV216-08NI (8-88)

2.62 Form EP-0543, Emergency Termination Message (sample)

FORM EP-0543 D — **PVNGS EMERGENCY PLANNING**

EMERGENCY TERMINATION MESSAGE FORM

1 *(circle one)* THIS IS A DRILL — THIS IS NOT A DRILL

2 This NAN call was initiated at: ____________
(time)

3 This is Palo Verde Nuclear Generating Station. The...

(circle one) UNUSUAL EVENT — SITE AREA EMERGENCY — ALERT — GENERAL EMERGENCY

declared in Unit ______ at ________ *(time)* on ________ *(date)*

has been terminated at ________ *(time)* on ________ *(date)*

4 The wind speed is ________ *(35' elev - 15 min avg)* MPH from ________ *(35' elev - 15 min avg)* Degrees

Authenticator Code: ____________

This is ____________ *(name)*: STSC Comm — Gov't Liaison *(circle one)*

at U1 STSC — U2 STSC — U3 STSC — EOF *(Circle ERO facility)*

5 THERE IS *(circle one)* A Radioactive Release — NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ________
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ________
- ☐ Other ________

6 *(circle one)* THIS IS A DRILL — THIS IS NOT A DRILL

Approval:

____
(EC / EOD Signature)

____________ *(Date)* ____________ *(Time)*

RESPONDING AGENCY	*PRIMARY LINK*	*ALTERNATE LINK*	*EMERGENCY NOTIFICATIONS* Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-256-1011]			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or [9-602-223-2000]			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-255-4845]			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-244-0504]			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or [9-602-273-1411]			
USNRC Headquarters *(STA will call)*	[301-816-5100]	[301-951-0550]			
7 GROUP PAGER: *(Read Message)*: "This is / is not a drill. This is PVNGS - the event has been terminated." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager [1611])*	Normal phone *(pager [7600-1611])*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager [1677])*	Normal phone *(pager [7600-1677])*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager [1633])*	Normal phone *(pager [7600-1633])*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	[81-1080] [81-1081] or [9-602-250-1070]			

F_EP0543.DOC — 09/09/99 09:31:09

2.63 Form EP-0560, Site Security Status (sample)

FORM EP-0560A PVNGS EMERGENCY PLANNING

SITE SECURITY STATUS

Name:		Date:	Time:

ACCESS CONTROL	
Site	**Protected Area**
Vehicle Traffic:	Personnel Traffic:
Areas to Avoid:	Areas to Avoid:

IMPACTS TO SECURITY

OFFSITE ASSISTANCE		
Notified	**ETA**	**Onsite**

TECHNICAL SUPPORT CENTER SECURITY

MISCELLANEOUS
Suspension of Safeguards:
Unaccounted Individuals:
Transportation:
Security Personnel Status:

2.64 Form EP-0561, Individual Accountability (sample)

FORM EP-0561 B **PVNGS EMERGENCY PLANNING**

INDIVIDUAL ACCOUNTABILITY

Assembly Area:		Date:	Time:
Department / Group:			Unit:
NAME	***ACAD NUMBER***	***NAME***	***ACAD NUMBER***
NOTE: Contact Security Supervision or FAX this completed form with Accountability results for this Assembly Area to the CAS			

2.65 Form EP-0570, RMS Overview, page 1 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 1 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-01	CH-1	Particulate	µCi / cc	Containment airborne - Isolates on SIAS / CIAS - Required for leak detection - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
	CH-3	Noble Gas	µCi / cc	Required for leak detection - Indicates actual concentration
RU-02	CH-1	Liquid	µCi / ml	Train-A Essential Cooling Water monitor
RU-03	CH-1	Liquid	µCi / ml	Train-B Essential Cooling Water monitor
RU-04	CH-1	Liquid	µCi / ml	S/G-1 blowdown monitor
RU-05	CH-1	Liquid	µCi / ml	S/G-2 blowdown monitor
RU-06	CH-1	Liquid	µCi / ml	Nuclear Cooling Water monitor
RU-07	CH-1	Liquid	µCi / ml	Auxiliary Steam Condensate monitor - HI Alarm diverts condensate to radwaste storage
RU-08	CH-1	Particulate	µCi / cc	Auxiliary Building airborne - Located downstream of RU-09 and RU-10 - Indicates rate-of-change in accumulated activity
	CH-2	Iodine	µCi / cc	
RU-09	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 100' elevation and below
RU-10	CH-1	Noble Gas	µCi / cc	Auxiliary Building airborne - 120' elevation and above
RU-12	CH-1	Noble Gas	µCi / cc	Waste Gas Decay Tank release monitor - HI Alarm isolates WGDT release
RU-14	CH-1	Particulate	µCi / cc	Radwaste Building Exhaust - Indicates rate-of-change in accumulated activity
RU-15	CH-1	Noble Gas	µCi / cc	Radwaste Building Exhaust
RU-16	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation personnel hatch
RU-17	CH-1	Radiation	mrem / hr	Containment general area at 140' elevation seal table area - Disconnected under power operation
RU-18	CH-1	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-19	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation - monitors new fuel racks
RU-20	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-21	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-22	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation general area in truck bay
RU-23	CH-1	Radiation	mrem / hr	Chemistry Laboratory 140' elevation general area
RU-24	CH-1	Radiation	mrem / hr	Central Calibration Facility north of Unit 1
RU-25	CH-1	Radiation	mrem / hr	Radwaste Building 100' elevation controlled machine shop
RU-26	CH-1	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area
RU-29	CH-1	Noble Gas	µCi / cc	Train-A Control Room Ventilation intake monitor - HI Alarm initiates CREFAS
RU-30	CH-1	Noble Gas	µCi / cc	Train-B Control Room Ventilation intake monitor - HI Alarm initiates CREFAS
RU-31	CH-1	Radiation	mrem / hr	Fuel Building 140' elevation Fuel Pool general area - HI Alarm initiates Train-A FBEVAS which cross-trips CREFAS
RU-33	CH-1	Radiation	mrem / hr	Containment 140' elevation refueling machine general area - Disconnected under power operation
RU-34	CH-1	Noble Gas	µCi / cc	Containment Purge release monitor
RU-37	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-A CPIAS which cross-trips CREFAS
RU-38	CH-1	Radiation	mrem / hr	Auxiliary Building 140' elevation east penetration Power Access Purge monitor - HI Alarm isolates Containment purge release and initiates Train-B CPIAS which cross-trips CREFAS

2.66 Form EP-0570, RMS Overview, page 2 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 2 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-5x	CH-1	Particulate	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
(51 / 52 / 53)	CH-2	Iodine	µCi / cc	Backup to RU-01 *(RU-51 Unit 1 / RU-53 Unit 2 / RU-52 Unit 3)*
	CH-3	Noble Gas	µCi / cc	Not normally used
RU-61	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 1 Plant Vent stack
RU-62	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 2 Plant Vent stack
RU-63	CH-1	Radiation	mrem / hr	Portable area monitor used as backup to Unit 3 Plant Vent stack
RU-139	CH-1	Radiation	mrem / hr	S/G-1 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-1 Main Steam Line-2 monitor
RU-140	CH-1	Radiation	mrem / hr	S/G-2 Main Steam Line-1 monitor
	CH-2	Radiation	mrem / hr	S/G-2 Main Steam Line-2 monitor
RU-141	CH-1	Noble Gas	µCi / cc	Condenser Vacuum Exhaust monitor - HI Alarm lines up condenser exhaust in Thru-Filter Mode
RU-142	CH-1	N^{16}	cpm	S/G-1 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-2	N^{16}	cpm	S/G-1 Main Steam Line-2 monitor for S/G tube leakage at power
	CH-3	N^{16}	cpm	S/G-2 Main Steam Line-1 monitor for S/G tube leakage at power
	CH-4	N^{16}	cpm	S/G-2 Main Steam Line-2 monitor for S/G tube leakage at power
RU-143	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent LO-Range monitor - actual concentration
	CH-2	Particulate	µCi / cc	Auxiliary Building Vent LO-Range monitor - indicates gross activity only
	CH-3	Iodine	µCi / cc	
RU-144	CH-1	Noble Gas	µCi / cc	Auxiliary Building Vent Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Auxiliary Building Vent HI-Range monitor
	CH-3	Rel Humidity	% RH	
	CH-4			Non-existent - Used as filter collection chambers
	CH-5			
RU-145	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust monitor - HI Alarm initiates Train-B FBEVAS which cross-trips CREFAS
RU-146	CH-1	Noble Gas	µCi / cc	Fuel Building Exhaust Mid-Range monitor
	CH-2	Noble Gas	µCi / cc	Fuel Building Exhaust HI-Range monitor
	CH-3			Non-existent - Used as filter collection chambers
	CH-4			
	CH-5			
RU-148	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation seal table area
RU-149	CH-1	Radiation	mrem / hr	Containment HI-Range monitor at 140' elevation personnel hatch
RU-150	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-A monitor at 80' elevation
RU-151	CH-1	Radiation	mrem / hr	Primary RCS Cold Leg Loop-B monitor at 80' elevation
RU-152	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 70' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 70' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west end 40' elevation near RDT Pumps
	CH-4	Radiation	mrem / hr	Auxiliary Building center wall 51' elevation at Containment
RU-153	CH-1	Radiation	mrem / hr	Auxiliary Building west wall 100' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Charging Pumps
	CH-3	Radiation	mrem / hr	Auxiliary Building east wall 100' elevation by Penetration Room

2.67 Form EP-0570, RMS Overview, page 3 of 3 (sample)

FORM EP-0570A **PVNGS EMERGENCY PLANNING**

RMS OVERVIEW (Part 3 of 3)

MONITOR	CHANNEL	TYPE	UNITS	INFORMATION
RU-154	CH-1	Radiation	mrem / hr	Auxiliary Building west end 120' elevation enroute to elevator
	CH-2	Radiation	mrem / hr	Auxiliary Building east end 120' elevation by RU-10 monitor
	CH-3	Radiation	mrem / hr	Control Building 140' elevation behind C.R. panels in racks
RU-155	CH-1	Radiation	mrem / hr	MSSS 86' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 86' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 88' elevation
	CH-4	Radiation	mrem / hr	Auxiliary Building 120' elevation *(Letdown monitor)*
RU-156	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 70' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 100' elevation
RU-157	CH-1	Radiation	mrem / hr	MSSS 100' elevation on S/G-1 side
	CH-2	Radiation	mrem / hr	MSSS 100' elevation on S/G-2 side
	CH-3	Radiation	mrem / hr	Auxiliary Building west penetration 120' elevation
RU-158	CH-1	Radiation	mrem / hr	Auxiliary Building east penetration 120' elevation
	CH-2	Radiation	mrem / hr	Auxiliary Building 140' elevation at Containment personnel hatch
	CH-3	Radiation	mrem / hr	Auxiliary Building east penetration 140' elevation by purge lines
	CH-4	Radiation	mrem / hr	Primary Chemistry Sampling Room 140' elevation general area

2.68 Form EP-0620, Technical Analysis Overview (sample)

FORM EP-0620A **PVNGS EMERGENCY PLANNING**

TECHNICAL ANALYSIS OVERVIEW

DATE:	TIME:
CRITICAL SAFETY FUNCTION STATUS	
Reactivity Control:	
Inventory Control:	
Pressure Control:	
Heat Removal:	
Maintenance of Vital AC:	
Maintenance of Vital DC:	
Containment Isolation:	
Containment Combustible Gas Control:	
Containment Temperature / Pressure Control:	
LOST SAFETY FUNCTION	
Time to boil:	
Time to uncover core:	
Time to core melt:	
Time to Rx vessel failure:	
Time to Containment failure:	
Time to reach 65 psig Containment:	

DOSE PROJECTIONS *(SA)* - HIGH SIDE		**RECOMMENDATION TO REDUCE OFFSITE DOSE CONSEQUENCES**
2 -Hour EAB *(Thyroid CDE)*:	REM	
2 -Hour EAB *(TEDE)*:	REM	
__-Hour EAB *(Thyroid CDE)*:	REM	
__-Hour EAB *(TEDE)*:	REM	
__-Hour LPZ *(Thyroid CDE)*:	REM	
__-Hour LPZ *(TEDE)*:	REM	

RECOMMENDED OPERATOR ACTION*(S)*
OTHER INFORMATION

2.69 Form EP-0630, Engineering Summary (sample)

FORM EP-0630A **PVNGS EMERGENCY PLANNING**

ENGINEERING SUMMARY

DATE:	TIME:	
CRITICAL SAFETY FUNCTION STATUS		
Reactivity Control:	Inventory Control:	
Pressure Control:	Heat Removal:	
Maintenance of Vital AC:	Maintenance of Vital DC:	
CTMT Isolation:	CTMT Combustible Gas Control:	
CTMT Temperature / Pressure Control:		
LOST SAFETY FUNCTION		
Time to boil:	*Time to uncover core:*	
Time to core melt:	*Time to Rx vessel failure:*	
Time to CTMT failure:	*Time to reach 65 psig CTMT:*	
EQUIPMENT OUT OF SERVICE	***FAILURE MODE***	***ESTIMATED RECOVERY TIME***
SYSTEMS STATUS		
Heat Sink Systems:		
Chemistry:		
Electrical:		
Mechanical:		
Reactor Engineering:		
Safety / Risk Assessment:		
RESOURCE RECOMMENDATION*(S)*		
Equipment	**Personnel**	
CONTINGENCIES		
OTHER INFORMATION		

Appendix D - Notification

1.0 Initial notifications

1.1 Noteworthy Items for notifications

1.1.1 The numbers on the colored Authenticator Code envelopes represent the sequence of actual events that have taken place on site during the current calendar year. They do not represent the month of the year. The white Authenticator Code envelopes are used for drills, exercises, and tests only. Use the same Authenticator Code for the entire event. However, if the event terminates after offsite agencies have been notified and then another event takes place, retrieve the next lowest-numbered colored Authenticator Code envelope.

1.1.2 If the event has been terminated prior to commencing notifications, the Emergency Termination Message Form should be used in place of the Palo Verde NAN Emergency Message Form. If the event or Protective Action Recommendation changes during notifications, inform the current contact that the event has changed and discontinue calling the remaining people on the call-out list.

1.1.3 Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, meteorological information required on any of the forms should be entered as "N/A". Ensure that the Emergency Coordinator / Emergency Operations Director is informed and that someone is sent to the Meteorological Tower for the necessary data to provide to the offsite agencies at a later time.

1.1.4 While making upgraded, downgraded, and/or termination notifications, complete the "Date / Time / Initials" columns for those agencies contacted. Certain agencies may not respond on backshifts or weekends. The individual notifying USNRC Headquarters will complete the "USNRC Headquarters" Section of the form.

1.1.5 If contact with the required agencies is not made via the NAN ringdown phones, either the NAN Radio Backup (PVNGS radio), the regular phone, or the cellular telephone must be used. The designated backup for the NAN is the PVNGS radio.

1.1.6 The Group Pager message that is read to Emergency Response Organization personnel should include the emergency classification by name, e.g., Unusual Event, Alert, etc.

1.1.7 All noteworthy items and problems should be recorded on the Action Logsheets.

1.2 Authenticator Codes

1.2.1 For initial notification of the current event, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope. Do not complete step 2 of the form at this time.

1.3 Completing the Emergency Message Form

1.3.1 Complete Steps 1, 4, and 6 of Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

1.3.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

1.4 Checking whether NAN is operational

1.4.1 If the NAN is operational, notify offsite agencies using step 1.5. If the NAN is not operational, notify offsite agencies using step 1.6.

1.5 Offsite notifications using the NAN

1.5.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

1.5.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.5.3 Repeat message once.

1.5.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.5.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.5.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

1.5.7 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.5.8 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

1.5.9 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A".and write your initials. Complete the remaining entries as appropriate.

1.5.10 Go to step 1.7 to perform Group Pager notifications.

1.6 Offsite notifications using the NAN Backup

1.6.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

1.6.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

1.6.3 Press the "Mode" button until the display indicates "GOVT AGENCY". The display will alternate between "GOVT AGENCY" and "ID - 710100". [handheld radio - enter "710100" on the keypad]

1.6.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

1.6.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

1.6.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

1.6.7 Record the time in Step 2 of the form.

1.6.8 Key the radio microphone and announce the following message: "ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

1.6.9 After a 30-second waiting period, repeat the preceding message.

1.6.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

1.6.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix C - Forms).

1.6.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

1.6.13 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

1.6.14 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Emergency Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

1.6.15 Go to step 1.7 to perform Group Pager notifications.

1.7 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

1.7.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

1.7.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

1.7.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

1.7.4 If this offsite notification is the initial notification for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

2.0 Followup agency notifications

As directed, perform the actions associated with followup offsite agency notifications.

NOTE

Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), is to be completed after the initial notifications have been made and as soon as time permits. It should be prepared when information becomes available and transmitted to the Arizona Radiation Regulatory Agency when requested. It does not have to be completed if classification and termination were made with the same notification.

2.1 Complete the Follow-up Emergency Message Form

2.1.1 Complete Steps 1 and 14 from Form EP-0541, Palo Verde NAN Emergency Message Form (see Appendix C - Forms). Complete Step 2.

2.1.2 Instruct the Radiation Protection Monitor / Radiological Assessment Coordinator to complete Steps 8, 9, and 10 of the form.

2.1.3 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 through 7 and 11 through 14 of the form, review the form for accuracy, and sign the form.

2.2 Fax the Follow-up Emergency Message Form

2.2.1 When the Follow-up Emergency Message Form has been requested by the Arizona Radiation Regulatory Agency, get the facsimile (FAX) telephone number to where it should be transmitted. Per the Emergency Coordinator's / Emergency Operations Director's instructions, transmit Form EP-0542, Follow-up Emergency Message (see Appendix C - Forms), to the Arizona Radiation Regulatory Agency via fax. When complete, inform the Emergency Coordinator / Emergency Operations Director that the Follow-up Emergency Message Form has been transmitted to the Arizona Radiation Regulatory Agency.

3.0 Emergency termination notifications

As directed, perform the actions associated with offsite agency emergency termination notifications.

NOTE

Notifications to State/County agencies per the Emergency Termination Message Form shall commence within 15 minutes following termination of the emergency declaration.

3.1 Authenticator codes

3.1.1 For initial notification and termination only, retrieve the lowest-numbered colored Authenticator Code envelope from the wall key box in the Shift Supervisor's office and remove the code from the envelope.

3.2 Completing the Emergency Termination Message Form

3.2.1 Complete Steps 1, 4, and 6 of EP-0543, Emergency Termination Message Form (see Appendix C - Forms), per the Emergency Coordinator's / Emergency Operations Director's instructions. Use ERFDADS to obtain meteorological information required for Step 4 on the form.

3.2.2 Instruct the Emergency Coordinator / Emergency Operations Director to complete Steps 3 and 5 of the form, review the form for accuracy, and sign the form.

3.3 Checking whether NAN is operational

If the NAN is operational, notify offsite agencies using step 3.4. If the NAN is not operational, notify offsite agencies using step 3.5.

3.4 Offsite notifications using the NAN

3.4.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

3.4.2 Announce the following message: "STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.4.3 Repeat message once.

3.4.4 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.4.5 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.4.6 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?" Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.4.7 When all agencies acknowledge receipt of the message, announce the following message: "END OF MESSAGE."

3.4.8 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.4.9 Go to step 3.6 for Group Pager notification.

3.5 Offsite notfications using the NAN Backup

3.5.1 Using either the NAN Radio Backup in the Satellite Technical Support Center, the Control Room, or the NAN Radio Backup in the Emergency Operations Facility [or a handheld portable plant radio], press the "Mode" button until the display indicates "NANB/U 18" [handheld radio - turn the channel selector knob to the "NANB/U" channel]. An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.

3.5.2 Press the "Page" button [handheld radio - press the right arrow key until "PAGE" appears on the display, then press the key below "PAGE"].

3.5.3 Press the "Mode" button until the display indicates "GOVT AGENCY". (The display will alternate between "GOVT AGENCY" and "ID - 710100".) [handheld radio - enter "710100" on the keypad]

3.5.4 Press the "Sel" button. [handheld radio - press the push-to-talk switch] This action sends a page to all government agencies offsite.

3.5.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

3.5.6 Press "Home" to return the display to "NANB/U 18" [handheld radio - no action required].

3.5.7 Record the time in Step 2 of the form.

3.5.8 Key the radio microphone and announce the following message:"ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STANDBY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

3.5.9 After a 30-second waiting period, repeat the preceding message.

3.5.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

3.5.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0543, Emergency Termination Message (see Appendix C - Forms).

3.5.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

3.5.13 Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

3.5.14 When all agencies acknowledge receipt of the message, announce the following message: "PALO VERDE OFF."

3.5.15 Note any problems that have occurred with the roll call or with the acknowledgment of offsite agencies. If an agency or person did not get notified, complete the Termination Notifications "Date" and "Time" Columns with "N/A" and write your initials. Complete the remaining entries as appropriate.

3.5.16 Go to step 3.6 for Group Pager notification.

3.6 Group Pager notifications

NOTE

If the preprogrammed Group Pager phone is inoperable, a regular phone can be used with the normal paging system for notification of Emergency Response personnel. Group Pager activation is unnecessary after all emergency response facilities have been activated, except for event termination messages. The ECC Dispatcher is called for initial notification and termination messages only.

3.6.1 Retrieve the appropriate information from Step 3 of the form and complete Step 7. Notify the remaining Emergency Response personnel with the preprogrammed Group Pager phone by pushing only the "EMER1" button, transmitting the message per Step 7 of the form, and hanging up. Repeat the message on "EMER2" and "EMER3". In the Control Room, the beige speaker box will repeat the message.

3.6.2 Notify the ECC Dispatcher by transmitting the message per Step 7 of the form.

3.6.3 Inform the Emergency Coordinator / Emergency Operations Director that all notifications have been completed.

3.6.4 If this offsite notification is the initial notification and termination for the current emergency event, then call personnel in the Unaffected Units and request them to update their colored Authenticator Code envelopes to reflect the next number in sequence following the one you have used. Ensure the numbers on the colored Authenticator Code envelopes in all three Units' wall key boxes correspond.

Appendix E - ERDS Activation

1.0 For an Alert or higher Emergency Classification, activate the Emergency Response Data System in accordance with the following instructions.

1.1 10 CFR 50.72 states: "The licensee shall activate the Emergency Response Data System (ERDS) as soon as possible, but not later than one hour, after declaring an emergency class of alert, site area emergency, or general emergency. The ERDS may also be activated by the licensee during emergency drills or exercises if the licensee's computer system has the capability to transmit the exercise data." At PVNGS, ERFDADS sends information via ERDS to the USNRC at both the Regional Office and Headquarters on the Federal Telecommunications System (FTS) telephone lines through three dial-up modems (one per Unit). ERDS in all three Units can be active simultaneously.

1.2 If ERFDADS is not functioning, perform the following actions:

1.2.1 Inform the Emergency Coordinator that ERDS cannot be activated.

1.2.2 Notify the USNRC via the FTS-2000 (ENS) telephone and report that ERDS cannot be activated.

1.3 If the current Unit number shown in the top left corner of the display must be changed to transmit data for the applicable Unit, perform the following actions:

1.3.1 With the left mouse button, click on "Top Menu" at the lower left corner of the display.

1.3.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.3.3 When the System Functions Menu - 1 of 2 display appears, click on the "Unit/Server Switch" box.

1.3.4 When the Unit/Server Switch display appears, highlight the desired Unit.

1.3.5 When highlighted, click on the "Apply" button at the top of the display.

1.3.6 The display should read "Unit switched -- PROCEED."

1.3.7 Click on the "OK" button in the box.

1.4 Log into the system.

NOTE

Failing to activate ERDS within 15 minutes following logon will result in automatic logoff and the logon process must be reinitialized prior to ERDS activation.

1.4.1 With the left mouse button, click on "Options" toward the left end of the top menu bar.

1.4.2 When the "Options" pull-down menu appears, click on "Logon".

1.4.3 When the "R*TIME/X Password Entry" box appears, click on the empty rectangle box to place the flashing cursor in the box.

1.4.4 Type STA and click on the "Apply" button in the "R*TIME/X Password Entry" box.

1.4.5 The "Password Entry" box should disappear and logon is complete.

1.5 Activate ERDS.

1.5.1 Following logon into the system, click on "Top Menu" at the lower left corner of the display.

1.5.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.5.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.5.4 When the ERDS Communication Link display appears, highlight the "Activate" box.

1.5.5 When highlighted, click on the "Apply" button at the top of the display.

1.5.6 The "Activate" highlight should disappear and ERDS is activated.

1.6 ERDS status may be monitored as follows.

1.6.1 To display the status of the ERDS communication link, click on "Top Menu" at the lower left corner of the display.

1.6.2 When the Top Menu display appears, click on the "System Function Displays" box.

1.6.3 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.6.4 When the ERDS Communication Link display appears, ensure that the information displayed indicates appropriate communications status and proper transmission of data.

1.7 Deactivate ERDS upon event termination. ERDS deactivation requires current system logon.

1.7.1 If system logon is required, use step 1.4.

1.7.2 Following system logon, click on "Top Menu" at the lower left corner of the display.

1.7.3 When the Top Menu display appears, click on the "System Function Displays" box.

1.7.4 When the System Functions Menu - 1 of 2 display appears, click on the "ERDS Communication Link" box.

1.7.5 When the ERDS Communication Link display appears, highlight the "Terminate" box.

1.7.6 When highlighted, click on the "Apply" button at the top of the display.

1.7.7 The "Terminate" highlight should disappear and ERDS is deactivated.

1.8 See Appendix O - ERFDADS operation for a list of data that is transmitted on ERDS.

Appendix F - Dose Projection

1.0 Noteworthy items

1.1 The MESOREM-JR computerized dose assessment program is the primary dose calculation method used for performing dose projections. If the primary method cannot be used at the preferred location, it should be performed at an alternate location and the dose projection results telecommunicated to the preferred location.

1.2 Printers shall not be connected to uninterruptible power supplies dedicated as backup power sources to computers designated for dose projection capability. If a computerized dose projection must be performed using an uninterruptible power supply as the sole power source, calculation results must be transcribed manually from the computer monitor display.

1.3 The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

1.4 The 1% failed fuel scenario should be selected unless plant conditions indicate severe (>10%) fuel clad failure.

1.5 Use of 100% fuel clad failure will project extreme levels of Iodine activity. If this scenario is used, Survey Teams must be made aware of the potential for extreme levels of Iodine activity and of the need to expedite data verification surveys. Since calculated doses are analytic estimates only, the calculations should be validated with field data as soon as possible. If calculated estimates differ considerably from associated field data, Emergency Operations Facility staff should use the "Back-Calculation" function to obtain an adjusted projection and the function should be repeated until a best-fit calculation correlates with the associated field data.

1.6 If the "F1 - Isolated Containment" option is selected from the Accident Menu, the Dose Projection Technical Basis Manual may be referenced for information pertinent to this accident scenario. Accordingly, correlation monitor values for Containment RMS Monitors RU-148 / RU-149 are also provided in the manual for instances when these monitors are inoperable or are not functioning properly.

1.7 Parameter entries must be in accordance with the options given for each, i.e., within a specified range, entered in a specific format, etc. Review each option. In cases where the actual value is less than the lowest range, or greater than the highest range value, enter the minimym or maximum allowable range value. Make a note of the actual value on page 4 of the printout.

1.8 If one projection is continued through a date change, and actual date on a menu screen will not be updated until that screen is exited and then re-entered on the new date. This will not affect the program results.

1.9 If RMS Monitors RU-139/140 are inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release. These default values, based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, will result in the issuance of very conservative Protective Action Recommendations. The Emergency Coordinator or Emergency Operations Director must be informed that values obtained are based on the assumption of 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release. A Survey Team must be dispatched immediately to the Site Boundary to verify the release levels.

1.10 RMS Monitors RU-139 / RU-140 will respond to N16 gamma during steam generator tube leakage at power operation in addition to designed activity monitoring. Use of at-power RU-139 / RU-140 monitor values could result in an extremely conservative dose projection. In this case, it is imperative to obtain a sample and repeat the dose calculation immediately after reactor scram.

1.11 During steam releases from specific plant systems, the possibility exists of the systems to achieve a solid condition. In these instances, any release would most likely become entrained with liquid. If this condition coincides with major steam generator tube failures, the projected Thyroid CDE value should be multiplied by a factor of 100.

1.12 The "F7 - Waste Gas Decay Tank Accident" selection on the Accident Menu is not appropriate for a surge tank or any tank / pathway gaseous release which may contain significant Iodine activity. The "F4 - Loss of Coolant Accident 1%" projection should be selected for any release containing potential Iodine activity (i.e., tank isolated for less than 45 days).

1.13 Unmonitored Release

Typical accident assumptions would indicate that a release is occurring which is not monitored by an RMS monitor, nor would there be any flow rate(s) available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release are a ruptured tank in the Radwaste yard which contained radioactive liquids, an outside fire involving radioactive waste, an accident involving waste shipment on site, an accident in the Radwaste Storage Building, etc. In all of these cases, release rates would typically be relatively low, but the potential would exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a MESOREM projection until actual Site Boundary data becomes available.

1.14 For unmonitored release events, the Survey Teams should be directed to obtain peak dose rate readings at the leading edge of the plume based on the current plume direction. The team(s) should be prepared to follow the leading edge as necessary. They should report current dose rates (closed window) which may be used as External EDE dose rates measured per hour for PAR determinations. The External EDE dose rates should be used, along with the current ERFDADS wind speed, to determine when the leading edge of the plume will reach the Site Boundary and what the dose rates will be at the time of arrival. Decay need not be taken into effect at this time. If Iodine shows any significance, the External EDE dose rate should be multiplied by 2. The net dose determined should be treated as TEDE for PAR purposes and Appendix B - Protective Action Recommendations, should be reviewed using this value to derive a qualified Protective Action Recommendation for the EC / EOD. In most cases, these actions will demonstrate Site Boundary dose to be minimal or zero, due to the low release rate. The team(s) should be instructed to obtain as many air samples as practicable to provide data for follow-up analyses. Appendix R - Dose Projection Technical Bases, provides additional methodologies and information which may be of use in several types of unmonitored scenarios.

2.0 MESOREM, Jr. startup

2.1 Select "MESOREM" from the functional display or select the MESOREM icon.

2.2 At the "PASSWORD" Prompt, type one of the following:

- STSC (for units inside the Protected Area)
- EOF (for the unit in the EOF and for program copies downloaded from the LAN)

2.3 At the "ID" Prompt, type 000000 (six zeroes).

2.4 Review the "Help" item that follows. Press <ENTER> when completed.

2.5 When the "Command Menu" appears, ensure that the "Current Time" field is correct toward the upper right portion of the display. If the time and/or date requires adjustment, select Q to quit and adjust the time and/or date accordingly. When complete, execute the previous steps to this point.

2.6 Re-evaluate the current time and date for accuracy.

2.7 Select <F2> ("Execute Dispersion Model").

NOTE

Selection <F2> ("Execute from Edited Files") on the "Mode-A Menu" display is employed only by Emergency Operations Facility personnel. Further guidance on this function may be obtained from the Dose Projection Technical Bases Manual.

2.8 When the "Mode-A Menu" display appears, select <F1> ("Fast Mode A - Initiate Model from Sequential Screens").

2.9 When the "Accident Menu" display appears, proceed to Section 3.0 of this document.

3.0 MESOREM, Jr. Mode A dose projection

3.1 When the "Accident Menu" appears as represented below, select the appropriate accident type:

3.1.1 F1 - Isolated Containment

3.1.2 F2 - Steam Generator Tube Rupture 1%

3.1.3 F3 - Steam Generator Tube Rupture 100%

3.1.4 F4 - Loss of Coolant Accident 1%

3.1.5 F5 - Loss of Coolant Accident 100%

3.1.6 F6 - Fuel Handling Accident

3.1.7 F7 - Waste Gas Decay Tank Accident

3.2 For the following prompts, enter the appropriate data as indicated:

3.2.1 Time Emergency Declared - enter the time the emergency was declared, as this entry will affect the plume mixing height. For back-calculations, enter the time the original event / release occurred.

3.2.2 Date Emergency Declared - enter the current date. For back-calculations, enter the appropriate date the original calculation was performed.

3.2.3 Adverse Weather or Normal Weather - enter Normal. Enter Adverse when weather / road conditions will delay evacuation times.

3.2.4 Expected Total Release Duration Time - if known, enter the expected duration of the release. If unknown, enter 2 hours initially. If release phase extends beyond 2 hours, enter values high enough to encompass total release phase time.

3.2.5 Has Release Been in Progress - enter Yes. Entering No will invoke the "Time Until Release Begins" Prompt, which allows for a bounding calculation based on degrading conditions and the release projected to begin in the future.

NOTE

The initial calculation of projected doses should be completed for a 2-hour release at the Site Boundary affected sector centerline. The Protective Action Recommendation issued may be based on this projection and the 2-hour time period appropriate for the release is the assumed basis used in the PVNGS / Arizona Radiation Regulatory Agency agreements. A projection should be run for the total release time if the release continues beyond 2 hours.

3.2.6 Time Release Has Been in Progress - enter the difference between the current time and the time the release began. Ensure that the time entered is less than the time entered for the "Expected Total Release Duration".

3.2.7 Has Reactor Been Scrammed - enter Yes if the source mix is decaying and is not directly attributable to a critical reactor.

3.2.8 Number of Hours and Minutes Since Scram - enter the difference between the current time and the time the source mix began to decay.

3:2.9 When the "Monitor Type Menu" appears, select the appropriate RMS Monitor for the applicable release path.

NOTE

Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, get weather information by dialing the National Weather Service in Phoenix (602-379-4609 or 602-379-4611) and requesting current meteorological data at PVNGS.

3.2.10 Wind Speed - enter the 15-minute average of the 35-foot elevation wind speed parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 1 mph.)

3.2.11 Wind Direction - enter the 15-minute average of the 35-foot elevation wind direction parameter obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 90º.)

NOTE

The default Delta-T used by the program is +18ºF, which is extremely stable, thus very conservative. Therefore, if ERFDADS meteorological data is unavailable and data has been obtained from the National Weather Service, a more appropriate Stability Class can be derived by selecting a Delta-T from the Alternative Delta-T Chart, as the National Weather Service is not able to provide Delta-T at PVNGS. The Stability Class will display after the Delta-T has been entered.

3.2.12 Delta-T - enter the 15-minute average Delta-T obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 18). If data has been obtained from the National Weather Service, select an appropriate Delta-T using the following Alternative Delta-T Table to derive an appropriate Stability Class

Alternative Delta T		
Wind Speed, mph	Day (light)	Night (dark)
< 4	- 1.6° F	+ 4.0 ° F
4 - 7	- 1.4° F	+ 2.0° F
> 7 - 9	- 1.4° F	+ 1.0° F
> 9 - 13	- 1.0° F	- 1.0° F
> 13	- 1.0° F	- 1.0° F

3.2.13 The calculated mixing depth, presented in units of meters, will display after the Ambient Temperature is entered. The mixing depth correlates to the height at which the plume stops rising and levels out.

3.2.14 Ambient Temperature - enter the 15-minute average Ambient Temperature obtained from ERFDADS meteorological data. (If ERFDADS and NWS data are both unavailable, enter 62.)

3.3 Press <ENTER>.

NOTE

Selection <F1> ("Grab Sample Analysis Complete") on the "Breakdown Menu" display is employed only by Emergency Operations Facility personnel. Use of this function is addressed in the Dose Projection Technical Bases Manual. Selection <F2> ("Grab Sample Analysis Incomplete") assumes a default isotopic mix, with the projection based on RMS Monitor values and process flow rate.

3.4 When the "Breakdown Menu" appears, select <F2> ("Grab Sample Analysis Incomplete").

NOTE

Filter efficiencies for both the Plant Vent and Fuel Building Exhaust are assumed to be 95% when in operation and lined up through filtration. Prior to data entry, the associated system status must be verified. If status cannot be verified or the system associated with the applicable release point is not in operation and lined up through filtration, then filter efficiency is assumed to be 0%. All other release points are assumed to be 0% efficient. RU-148 / RU-149 values obtained from other sources may need to be converted to REM / hour for input into the system.

3.5 At the prompts requiring RMS Monitor data, process flow rate, and filter efficiency, enter the data associated with the applicable release point.

3.6 At the "Do you wish to revise effluent data again?" Prompt, enter Y if a review / correction of data is required or N to continue.

3.7 At the "Would you like an automatic dump to the printer" Prompt, enter Y to perform / print the calculation or N to review / transcribe the calculation results from the computer monitor display.

3.8 When the prompt "Will this be a simultaneous release?" appears, select the most appropriate response based on the following option summary:

3.8.1 Y - returns to the "Accident Menu" to allow for performance of a second projection using the same meteorological data to obtain summed doses. If this option is selected, the dose projection starting with step 2.0 must be performed a second time, after which the prompt "Do you wish to consider other release points?" will display. Select N after all release calculations have been performed. A summation dose report entitled "Simultaneous" will then be spooled to the printer.

3.8.2 N - invokes the "Receptor Display Menu", offering additional options for detailed reviews of the data. (These are generally employed by the Radiological Assessment Coordinator in the Emergency Operations Facility using the Dose Projection Technical Bases Manual).

3.9 When the "Receptor Display Menu" appears, select Q, which invokes the prompt "Do you wish to perform another forecast? [Y/N]." If another projection is required, enter Y and perform another projection from the "Accident Menu" starting with step 2.0. Enter N to continue with the existing projection from the "Command Menu" selections.

3.10 Transfer the printed report to the Radiation Protection Monitor in the Affected Unit STSC or to the Radiological Assessment Coordinator in the EOF as soon as possible. Additional copies of the printed report may be produced and distributed as required.

4.0 MESOREM, Jr. availability

4.1 MESOREM-JR is currently available in each Unit and in the EOF. The EOF MESOREM-JR computers are equipped with uninterruptible power supplies. Additionally, each location has MESOREM-JR available on a backup computer. A laptop computer in the EOF equipment locker is loaded with Windows 95 and Mesorem. This unit is intended to be used should an EOF relocation be necessary. An older laptop computer in the TSC equipment locker is loaded with Mesorem and intended to be available for use in a blackout condition (when normal power may be lost to much of the site). The Diesel Generator powering the TSC will provide power to run the laptop in that worst case situation.

4.2 A copy of the program is also available on PVNGS default Drive V: in Directory \Eplan\Mesorem\ for use by personnel in the Chemistry and Radiation Protection Groups to provide event support as required. However, the MESOREM-JR dose assessment program should not be executed on the LAN, as multi-user support is not possible. The program will run under MS Windows 95, MS Windows 98, or MS Windows NT (Version 4.0 or later) as a local copy. The program can also be executed on a computer running MS-DOS as the operating system.

4.3 To install MESOREM-JR from the LAN onto a local computer, create a directory on the local computer named MESOREM at the root level (i.e., C:\MESOREM). Download all MESOREM files from the LAN into the C:\MESOREM Directory on the local computer (2 MB HDD free space required). Execute the MESOREM.BAT File to start the program. (This action will place the user at the beginning of Section 2.0 in this procedure.) When finished with the program, delete all MESOREM files and the C:\MESOREM Directory from the local computer. Deletion of all MESOREM files on the local computer after use will ensure continuous synchronization of current MESOREM revision copies currently installed on all computers.

Appendix G - Core Damage Assessment

1.0 General Information

NOTE

This document directly supports PVNGS Unit 2 Sale / Leaseback Agreements. Any changes to or cancellation of the assessment methodology incorporated herein shall require review and approval by Arizona Public Service Company Law Department staff prior to implementation.

1.1 The APS employee tasked with performing the instructions within this document shall be current in qualifications and have records on file certifying successful completion of Training Course NGT69, Core Damage Assessment, or its equivalent, prior to performing the instructions within this document.

1.2 The principle method of core damage assessment (CDA) following an accident is based on radiochemistry data. Other plant indications may be available which can improve the estimation of core damage. These include incore temperature indicators, Containment radiation monitors, and the total quantity of Hydrogen released from Zirconium degradation. When possible, these additional indicators should be factored into the assessment.

1.3 PASS does not have the ability to obtain a sample representative of the water in the Containment sump until after a RAS occurs. Core damage estimates made using radiochemistry data during a small-break LOCA, in which a small amount of water is in Containment and a RAS has not yet occurred, shall only be made utilizing the off-gas data obtained from the Containment atmosphere and RCS samples. Once a RAS has occurred and suction has been transferred to the Containment sump, a sample can be obtained from the safety injection line.

1.4 The assessment of core damage obtained by using this document is only an estimate. The techniques employed in these instructions are only accurate in locating core conditions to within one or more of the ten (10) USNRC Fuel Damage Categories

1.5 Severe core damage does not occur uniformly. Damage occurring in regions of the core with higher power densities and along blocked channels will be more extensive than in other regions of the core. Therefore, the identification of a single USNRC Category may not sufficiently describe the actual damage state of the core. The most desired assessment is one made with the most accuracy and not necessarily the most conservatism.

1.6 Under emergency conditions, there can be extreme demands placed on the Chemistry Technician's time and on the sampling system. Conditions may change rapidly, requiring a re-evaluation of sample options and the cancellation of operations in progress to begin others. For this reason, it is important that efficient communications be established between the Shift Technical Advisor or Reactor Analyst, the Chemistry Coordinator, and the Emergency Coordinator.

2.0 Core Exit Thermocouple CDA Information

2.1 The assessment of core damage obtained by this method extends up to the time of clad rupture on most of the fuel rods. This time occurs early in very severe core uncovering accidents. More severe core damage cannot be quantified by the Core Exit Thermocouple (CET) assessment method.

2.2 The maximum CET temperature represents a low limit estimate of steam temperature and the peak core temperature could be up to 500ºF higher.

2.3 The curve in Figure 1 assumes that the fuel has been maintained at its rupture temperature for 10 minutes.

2.4 The CET temperature lags the steam temperature by about 6 minutes. Thus, this method is most appropriate for relatively slow core uncovering with a maximum temperature below the rapid oxidation initiation temperature of 1800ºF. A smooth CET recording and a time of 20 minutes (or longer) until the core uncovers are indicators for a reliable prediction of clad rupture.

2.5 If pressure drops below 100 psia within the first 2 minutes of indication of the accident, a large break is indicated and undetected core heatup will occur. Depending on the rate of refill, the thermocouple temperature may rise rapidly, then quench when the core is recovered. This method may yield very low estimates of clad rupture in these cases.

2.6 If the RCS pressure, at the time of maximum CET readings, is greater than 1650 psia, it could exceed the rod internal gas pressure, depending on burnup. This could cause clad collapse rather than clad ballooning. The clad rupture criteria for such rod collapse are less well defined. However, at temperatures in excess of 1800ºF (where the highest pressure curve on Figure 1 applies), clad failure sufficient to release fission gas is likely and this method can be used to obtain estimates of core damage.

2.7 If a peak CET temperature of 2200ºF is reached, over 50% of the rods have ruptured, regardless of core burnup or system pressure.

3.0 Containment Radiation Monitor (RMS) CDA Information

3.1 This method of core damage assessment relies upon radiation dose rate measurements taken from one or more monitors located inside the Containment Building to determine the total quantity of fission products released from the core. The quantity of fission products present at the location of the monitors may fluctuate rapidly due to transient plant conditions; therefore, multiple measurements within a minimum time frame are recommended. Samples obtained during rapidly changing plant conditions should not be weighed heavily in the assessment of core damage. If RU-148 and RU-149 are both not available for dose rate measurements, equivalent readings can be obtained from the Radiation Protection Monitor in the Satellite Technical Support Center or the Radiological Assessment Coordinator in the Emergency Operations Facility.

3.2 This method is limited to the upper bounding condition of fission product release from the core due to fuel overheat. Concurrent with fuel overheat, there may be localized fuel pellet melting. This method does not attempt to identify the extent of any potential fuel melting, since the transport of non-volatile fission products released due to melting is not known.

3.3 This method is limited to the interpretation of the dose rate measurement resulting from a mix of fission products. Thus, this method cannot accurately distinguish between the conditions of fuel cladding failure and fuel overheat when the resulting dose rates are the same. This method does provide an upper limit estimate of the progressive core damage. Concurrent conditions of cladding failure and fuel overheat should be anticipated due to radial distribution of heat generation within the core.

3.4 A number of factors influence the reliability of the measured radiation dose rates upon which this method is based. Reliability is influenced by the ability to obtain representative measurements due to the incomplete mixing of the measured media and equipment limitations. The method relies on analytically determined values of the best estimate dose rates that are anticipated to correspond to the specific categories of core damage. These analytical values are based on assumptions made about the identity and the relative proportions of the fission products released from the core and their transport within Containment.

3.5 Dose rate measurements may have been obtained during transient conditions. Measurements taken during steady-state conditions should weigh more heavily.

3.6 Dose rates significantly above the lower bounds for the category of major fuel pellet overheat may indicate concurrent fuel pellet melting. This method may not be used to estimate the degree of fuel pellet melting.

3.7 Dose rates within the category of fuel overheating may be anticipated to include concurrent fuel cladding failure. This method may not be used to distinguish the relative contributions of the two categories to the total dose rate. The method does provide an estimate of the highest category of damage and assumes 50% of core Iodines are available for release to Containment. This number may be over-estimated, thus resulting in a non-conservative damage assessment.

3.8 Dose rates corresponding to the two categories of major fuel cladding failure and initial fuel overheat are observed to overlap in Figure 2. The evaluation of other plant parameters may be required to distinguish between them. However, concurrent conditions may be anticipated.

3.9 Several assumptions were made in the calculations performed to generate the graph of Figure 2. They include:

3.9.1 The distribution of all airborne radionuclides in the Containment atmosphere is homogeneous.

3.9.2 The dose rates were measured at the Containment top-centerline.

3.9.3 The Containment Spray System has operated for 2 hours and has effected a halogen reduction by a factor of 7.

3.9.4 The gamma flux at the detector was determined by the point kernel method.

4.0 Hydrogen Production CDA Information

4.1 This method of core damage assessment is not a unique indicator of the amount of core clad oxidation, since the Hydrogen in Containment contains a mixture of Hydrogen generated within the core by clad oxidation and also Hydrogen from radiolytic dissociation of water and oxidation of aluminum and zinc.

4.2 This method only provides an estimate of the percentage of rods which have progressed to at least clad rupture or clad embrittlement. It does not attempt to predict the physical configuration of these rods which have progressed beyond local clad fragmentation.

4.3 Depending on the accident conditions, a given total amount of Hydrogen produced by oxidation of the fuel clad can represent varying local amounts and distributions of clad damage. This method biases the damage estimates such that the results represent lower limit estimates of clad damage.

4.4 The basis for this assessment assumes zero inlet flow into the core and also assumes the two-phase level within the core is uniform across the entire core.

4.5 By the time that 0.5% of the core clad has oxidized during boil-off, between 40% and 100% of the rods can be considered to be ruptured, depending on system pressure. Hydrogen measurement serves only as a backup to more sensitive methods of determining clad rupture. If the Hydrogen measurement indicates greater than 20% of the clad has oxidized, then substantial core damage is certain, regardless of the particular reflood scenario. For a given percent of oxidation of the core clad, the lower limit estimate of embrittled clad in the assessment of the percent of embrittled fuel rods is for most scenarios, which presents the least amount of potential structural damage. The actual damage is probably greater.

4.6 When the pressure during core uncovering is less than about 100 psia, a rapid core uncovering by blowdown has probably occurred. Heatup with minimum clad oxidation occurs. The extent of potential clad structural failure by melting may be greater than the upper limit of embrittlement as determined by core clad oxidation.

4.7 If inlet flow exists while the core is uncovering, the rate of uncovering is slower than was assumed for the derived curves of the figures used in this method. For a measured total amount of oxidation, the local percentage of oxidation is probably greater along a shorter length of the upper portions of the fuel.

4.8 This method is not acceptable under conditions where a void exists in the Reactor Coolant System.

5.0 Radiological Analysis CDA Information

5.1 This method relies on samples obtained from multiple locations inside the Containment Building to determine the total quantity of fission products released from the core. The amount of fission products present at each sample location may be changing rapidly due to transient plant conditions. Therefore, an accurate assessment requires that the samples be completed within a minimum time period and obtained under stabilized plant conditions. Samples obtained during rapidly changing plant conditions should not be weighed heavily into the assessment of core damage.

5.2 Samples obtained during the accident at TMI-2 indicate that the amount of Iodine predicted to be released is grossly over-estimated.

5.3 A number of factors influence the reliability of the Chemistry samples upon which this method is based:

5.3.1 Reliability is influenced by the ability to obtain representative samples due to incomplete mixing of the fluids and by equipment limitations.

5.3.2 The accuracy achieved in the radiological analyses are also influenced by a number of factors:

5.3.2.1 The equipment employed in the analysis may be subjected to high levels of radiation exposure over extended periods of time.

5.3.2.2 Technicians are required to exercise considerable caution to minimize the spread of radioactive materials.

5.3.2.3 Samples have the potential of being contaminated by numerous sources and may not be representative.

5.3.2.4 Plate-out, precipitation, and chemical reactions may take place in the long sample lines. Therefore, the results obtained may not be representative of actual plant conditions.

5.3.3 To minimize these effects, multiple samples should be obtained over an extended time period from each location.

6.0 Core Damage Evaluation

6.1 The core damage estimate methods presented are not required to be performed in any given order and all methods may not be appropriate for the given accident scenario. However, it is recommended that as many applicable methods as necessary be used prior to making a final assessment of core damage. The figures in this document will aid in the assessments.

6.2 For core damage assessment using Core Exit Thermocouples, complete Form EP-0511, Core Exit Thermocouple CDA (see Appendix C - Forms).

6.3 For core damage assessment using Containment radiation monitors, complete Form EP-0512, Containment RMS CDA (see Appendix C - Forms).

6.4 For core damage assessment using Hydrogen production, complete Form EP-0513, Containment Hydrogen CDA (see Appendix C - Forms)

6.5 For core damage assessment using radiological analysis, complete Form EP-0514, Containment Radiochemistry CDA (see Appendix C - Forms).

6.6 When all applicable methods for assessing core damage have been completed, make a final assessment utilizing all available information from the four methods of assessment. The final assessment requires sound engineering judgment and knowledge of all biases and assumptions discussed under Personnel Indoctrination in Section 1.0 through 5.0 of this document.

6.7 Using the previously mentioned considerations, evaluate the final assessment of core damage for accuracy.

6.8 Using section 7.0, Fuel Damage Categories, compare the results obtained for the final core damage assessment to the USNRC Categories of Fuel Damage and select the category most accurately matching that derived in the final assessment.

6.9 Report the results obtained from the comparison to the Emergency Coordinator as soon as possible.

7.0 **Fuel Damage Categories**

7.1 Use the table below for comparisons with the final core damage assessment obtained in steps 6.2 through 6.9.

CATEGORY	FUEL DAMAGE
1	No Fuel Damage
2	Initial Cladding Failure
3	Intermediate Cladding Failure
4	Major Cladding Failure
5	Initial Fuel Pellet Overheating
6	Intermediate Fuel Pellet Overheating
7	Major Fuel Pellet Overheating
8	Fuel Pellet Melt
9	Intermediate Fuel Pellet Melt
10	Major Fuel Pellet Melt

7.2 Clad damage characteristics of fuel damage

CLAD DAMAGE CHARACTERISTICS OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	TEMPERATURE RANGE °F	MECHANISM OF DAMAGE	CHARACTERISTIC MEASUREMENT	MEASUREMENT RANGE	PERCENT OF DAMAGED RODS
1. No Fuel Damage	750	None			< 1
2. Initial Cladding Failure				< 1550°F	< 10
3. Intermediate Cladding Failure	1200-1800	Rupture Due to Pin Overpressure	Maximum Core Exit Thermocouple Reading	< 1700°F	10-50
4. Major Cladding Failure				< 2300°F 1-5% Oxidation	> 50
5. Initial Fuel Pellet Overheating				Core Oxidation 1-5%	< 10
6. Intermediate Fuel Pellet Overheating	1800-3350	Loss of Structure Integrity Due to Fuel Clad Oxidation	Amount of Hydrogen Gas Produced *(Equivalent to % of Core Oxidation)*	5-20%	10-50
7. Major Fuel Pellet Overheating	3450			20-65%	> 50

NOTE: This table is to be used for both the CET and Hydrogen methods of core damage assessment

7.3 Dose rate characteristics of USNRC categories of fuel damage

DOSE RATE CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY	DISTRIBUTION OF FISSION PRODUCTS IN CONTAINMENT
1. No Fuel Damage	Halogen Spiking Tramp-Uranium	Gas Gap	< 1%	Airborne
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	< 10%	Airborne
3. Intermediate Cladding Failure		Gas Gap	10-50%	Airborne
4. Major Cladding Failure		Gas Gap	> 50%	Airborne
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	< 10%	Airborne: 100% Noble Gas 25% Halogen Plated Out: 25% Halogen 1% Solids
6. Intermediate Fuel Pellet Overheating		Fuel Pellet	10-50%	
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet	> 50%	

NOTE: This table is to be used for the Containment Radiation Monitor method of core damage assessment

7.4 Radiological characteristics of USNRC categories of fuel damage

RADIOLOGICAL CHARACTERISTICS OF USNRC CATEGORIES OF FUEL DAMAGE

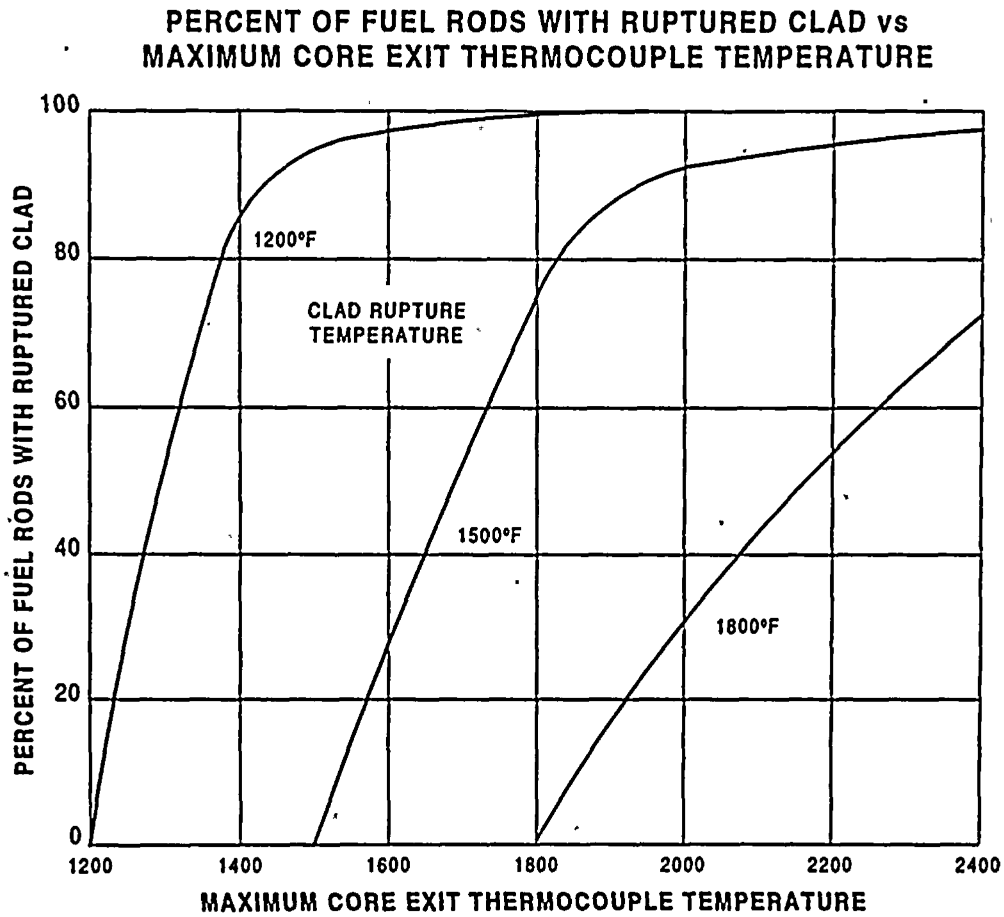
USNRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	CHARACTERISTIC ISOTOPE	RELEASE OF CHARACTERISTIC ISOTOPE AS A % OF SOURCE INVENTORY
1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	I^{131}, Cs^{137}, Rb^{88}	< 1%
2. Initial Cladding Failure	Clad Burst and Diffusional Gap Release	Gas Gap	Xe^{131m}, Xe^{133}, I^{133}	< 10%
3. Intermediate Cladding Failure		Gas Gap		10-50%
4. Major Cladding Failure		Gas Gap		> 50%
5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	Cs^{134}, Rb^{88}, Te^{129}, Te^{132}	< 10%
6. Intermediate Fuel Pellet Overheating		Fuel Pellet		10-50%
7. Major Fuel Pellet Overheating	Diffusional Release from UO_2 Grains	Fuel Pellet		> 50%
8. Fuel Pellet Melt	Escape from Molten Fuel	Fuel Pellet	Ba^{140}, La^{140}, La^{142}, Pr^{144}	< 10%
9. Intermediate Fuel Pellet Melt		Fuel Pellet		10-50%
10. Major Fuel Pellet Melt		Fuel Pellet		> 50%

NOTE: This table is to be used for the Radiochemistry method of core damage assessment

8.0 Figures

8.1 Figure 1 - Percent of fuel rods with ruptured clad vs. maximum Core Exit Thermocouple temperature

FIGURE 1

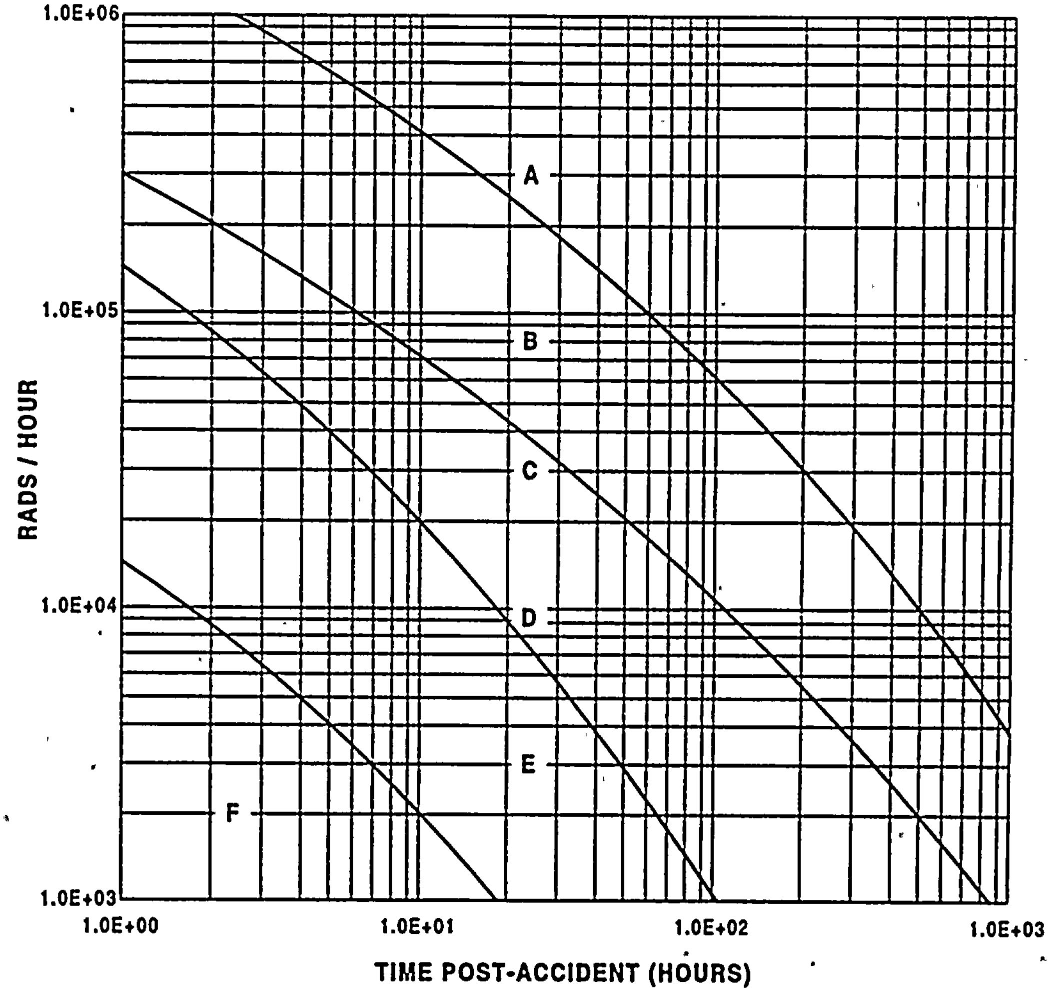


When the pressure in Form EP-0511, Step 1, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.2 Figure 2 - CDA by Containment radiation level

FIGURE 2

CDA BY CONTAINMENT RADIATION LEVEL

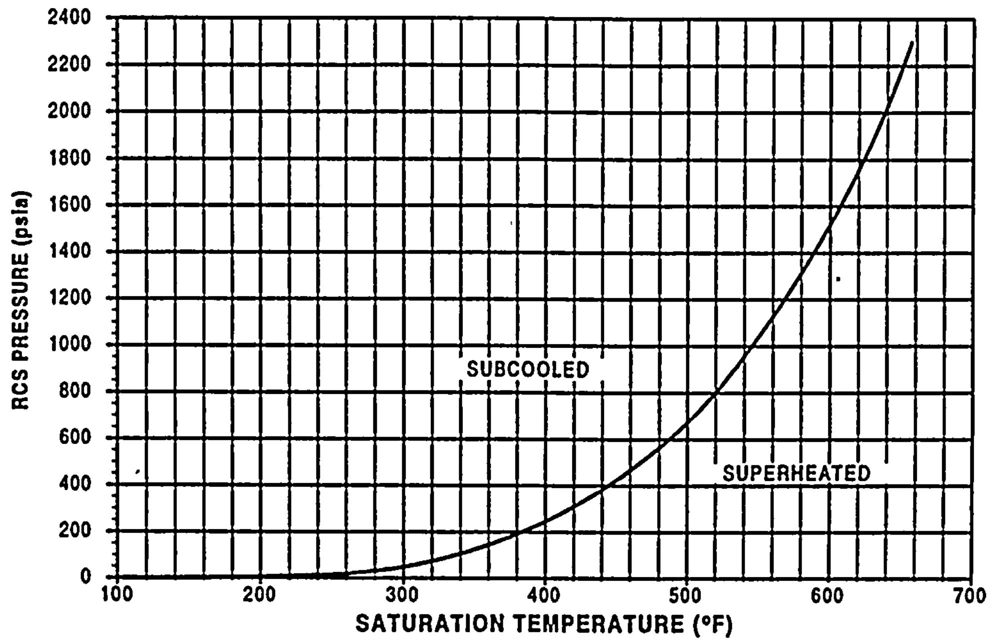


A - Major Fuel Overheat
B - Intermediate Fuel Overheat
C - Initial Fuel Overheat
D - Major Cladding Failure
E - Intermediate Cladding Failure
F - Initial Cladding Failure

8.3 Figure 3 - Pressure vs saturation temperature

FIGURE 3

PRESSURE vs SATURATION TEMPERATURE



8.4 Table - Pressure vs saturation temperature

PRESSURE vs SATURATION TEMPERATURE													
psla	xF	psla	xF	psla	xF	psla	xF	psla	xF	psla	xF	psla	xF
20	228.0	130	347.3	240	397.4	550	476.9	1100	556.3	1650	609.1	2400	662.1
30	250.3	140	353.0	250	401.0	600	486.2	1150	561.8	1700	613.1	2500	668.1
40	267.3	150	358.4	260	404.4	650	494.9	1200	567.2	1750	617.1	2600	673.9
50	281.0	160	363.6	270	407.8	700	503.1	1250	572.4	1800	621.0	2700	679.5
60	292.7	170	368.4	280	411.1	750	510.8	1300	577.4	1850	624.8	2800	685.0
70	302.9	180	373.1	290	414.3	800	518.2	1350	582.3	1900	628.6	2900	690.2
80	312.0	190	377.5	300	417.4	850	525.2	1400	587.1	1950	632.2	3000	695.3
90	320.3	200	381.8	350	431.7	900	532.0	1450	591.7	2000	635.8	3100	700.3
100	327.8	210	385.9	400	444.6	950	538.4	1500	596.2	2100	642.8	3200	705.1
110	334.8	220	389.9	450	456.3	1000	544.6	1550	600.6	2200	649.5	3208	705.5
120	341.3	230	393.7	500	467.0	1050	550.5	1600	604.9	2300	655.9		

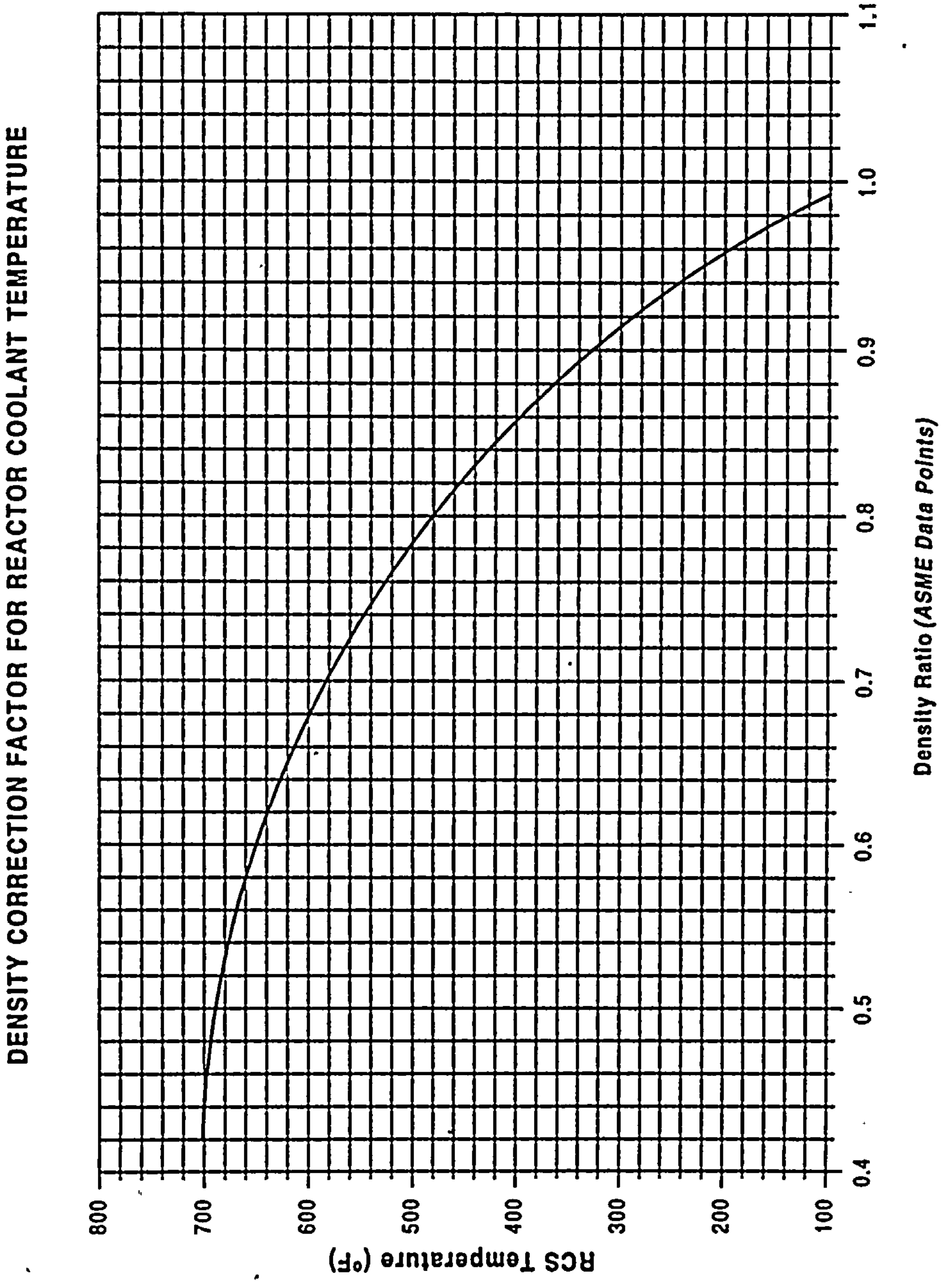
8.5 Figure 4 - RCS vessel level vs. volume

8.5.1 When the RCS is full, the RCS volume = 3.78E+08 cc. To determine the RCS water volume when the RCS is not full, the Reactor Vessel Level Monitoring System (RVLMS) is used. This system includes 8 detectors located at different levels in the reactor vessel. The approximate RCS level can be determined by how many detectors have uncovered. The information below provides the volume to be used at each detector location:

DETECTOR	VOLUME BELOW *(cc)*
HJTC #1	1.51E+08
HJTC #2	1.37E+08
HJTC #3	1.22E+08
HJTC #4	1.08E+08
HJTC #5	1.02E+08
HJTC #6	9.68E+07
HJTC #7	9.12E+07
HJTC #8	8.57E+07

8.6 Figure 5 - Density correction factor for reactor coolant temperature

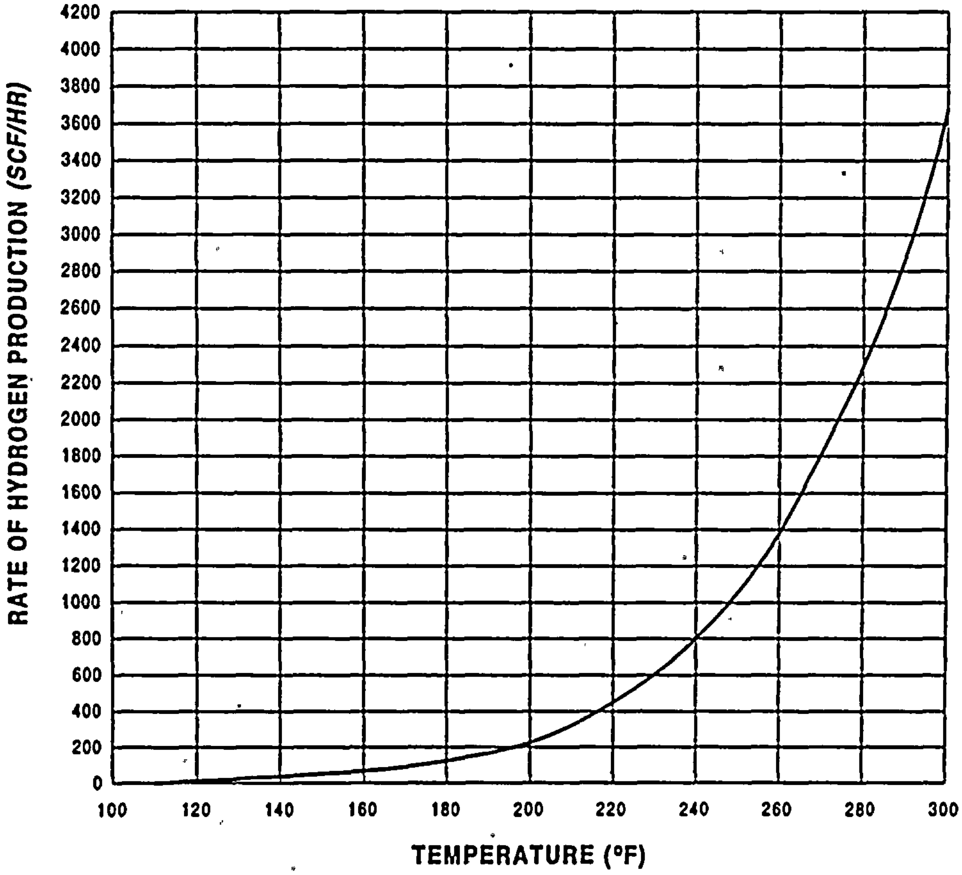
FIGURE 5



8.7 Figure 6 - Hydrogen production rate from aluminum and zinc vs. temperature for PVNGS

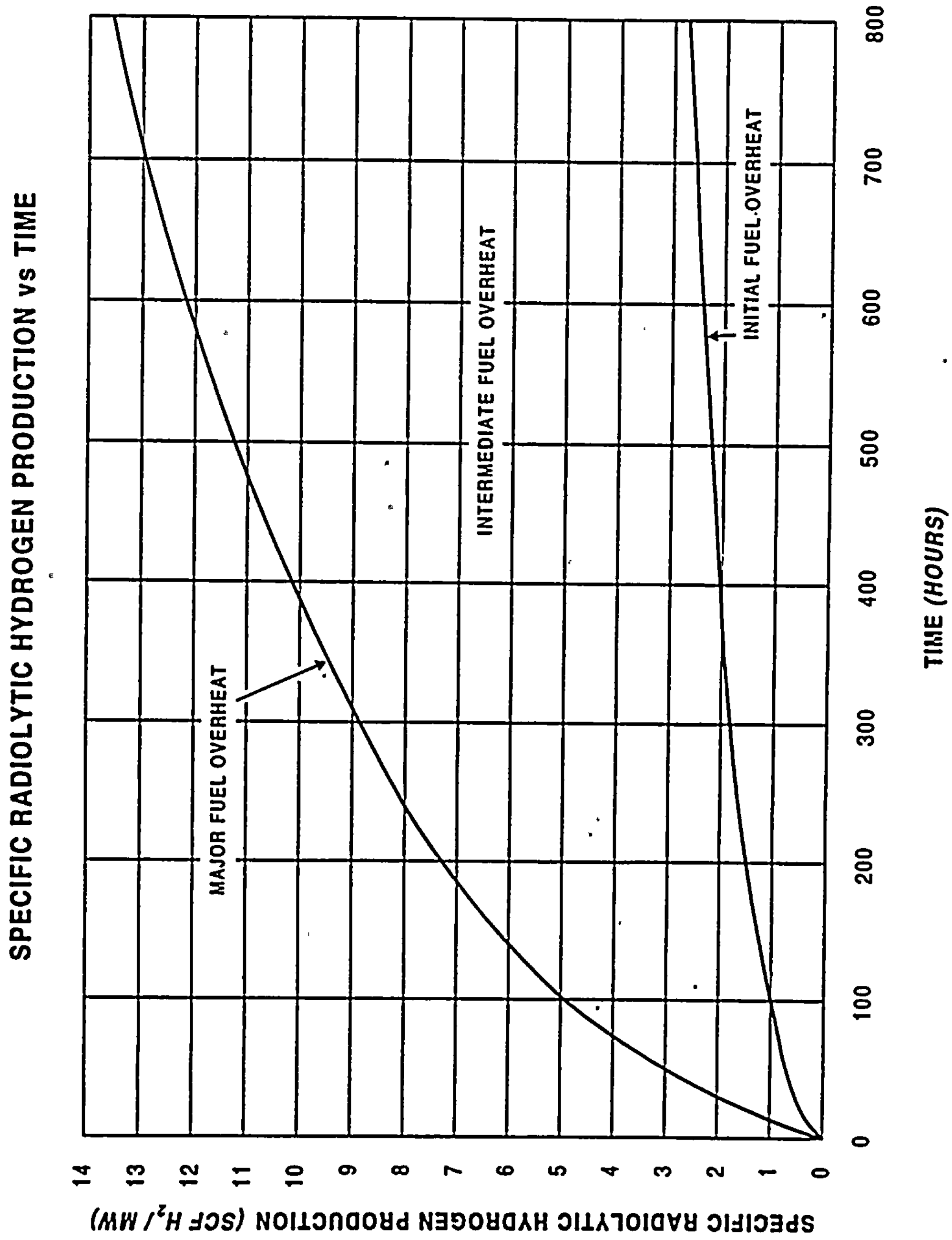
FIGURE 6

HYDROGEN PRODUCTION RATE FROM ALUMINUM AND ZINC vs TEMPERATURE FOR PVNGS



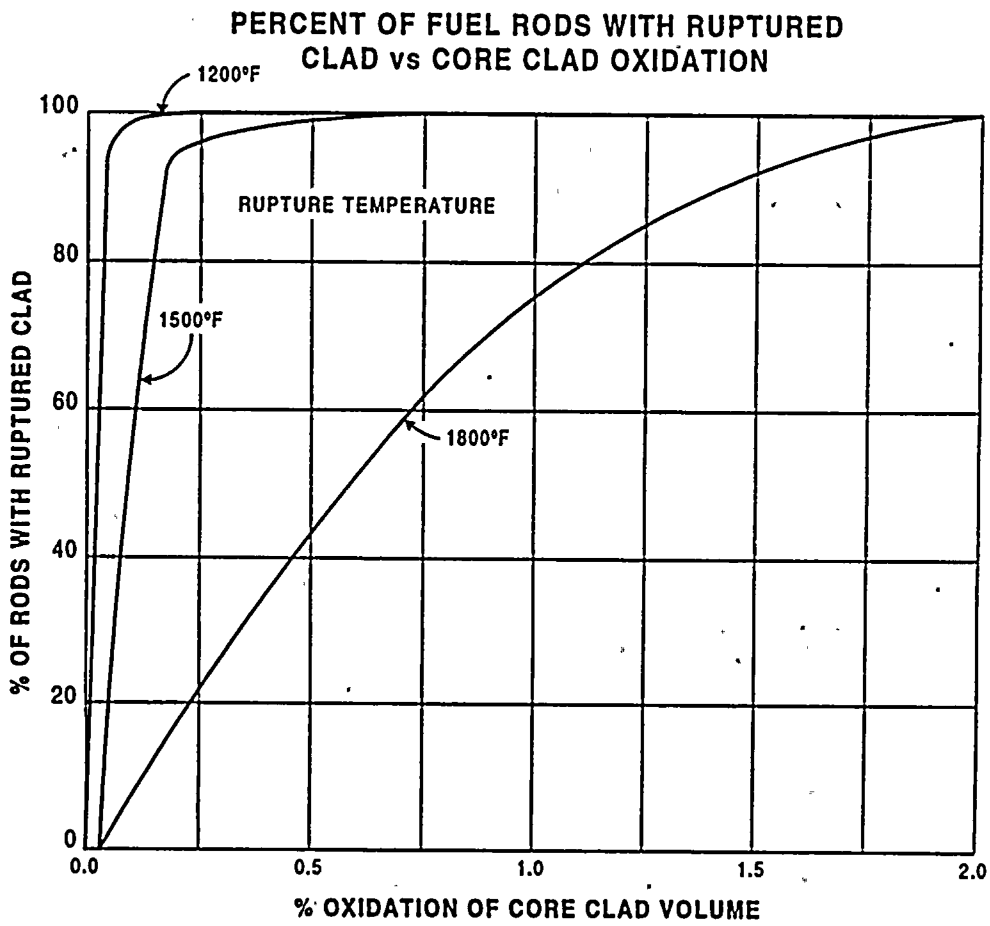
8.8 Figure 7 - Specific radiolytic hydrogen production vs. time

FIGURE 7



8.9 Figure 8 - Percent of fuel rods with ruptured clad vs. core clad oxidation

FIGURE 8

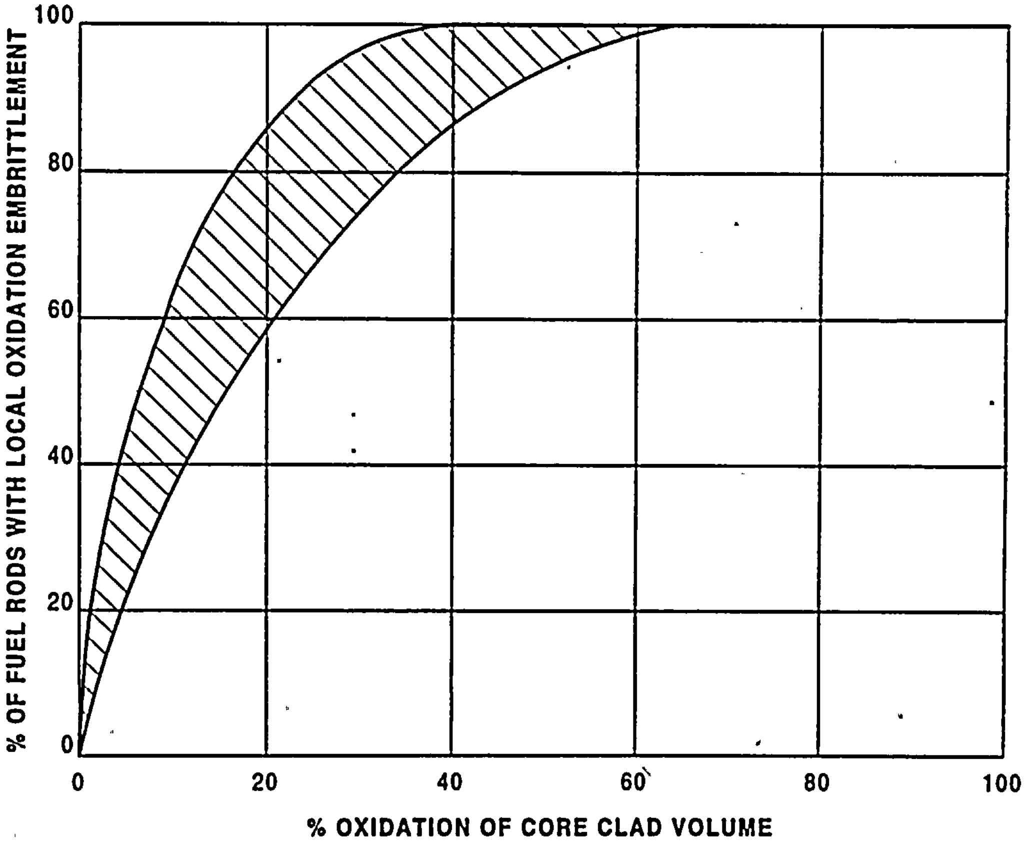


When the pressure in Form EP-0513, Step 2, is:	*Use Curve Labeled with Temperature:*
< 100 psia	1200°F
< 1200 psia	1500°F
< 1650 psia	1800°F

8.10 Figure 9 - % of the fuel rods with oxication embrittlement vs. total core oxidation for 1% to 3% decay heat and 300 PSIA to 2500 PSIA when coolant level drops by boil-off with no inlet flow until core is rapidly quenched

FIGURE 9

% OF THE FUEL RODS WITH OXIDATION EMBRITTLEMENT vs TOTAL CORE OXIDATION FOR 1% TO 3% DECAY HEAT AND 300 PSIA TO 2500 PSIA WHEN COOLANT LEVEL DROPS BY BOIL-OFF WITH NO INLET FLOW UNTIL CORE IS RAPIDLY QUENCHED



8.11 Figure 10 - Sample locations appropriate for core damage assessment

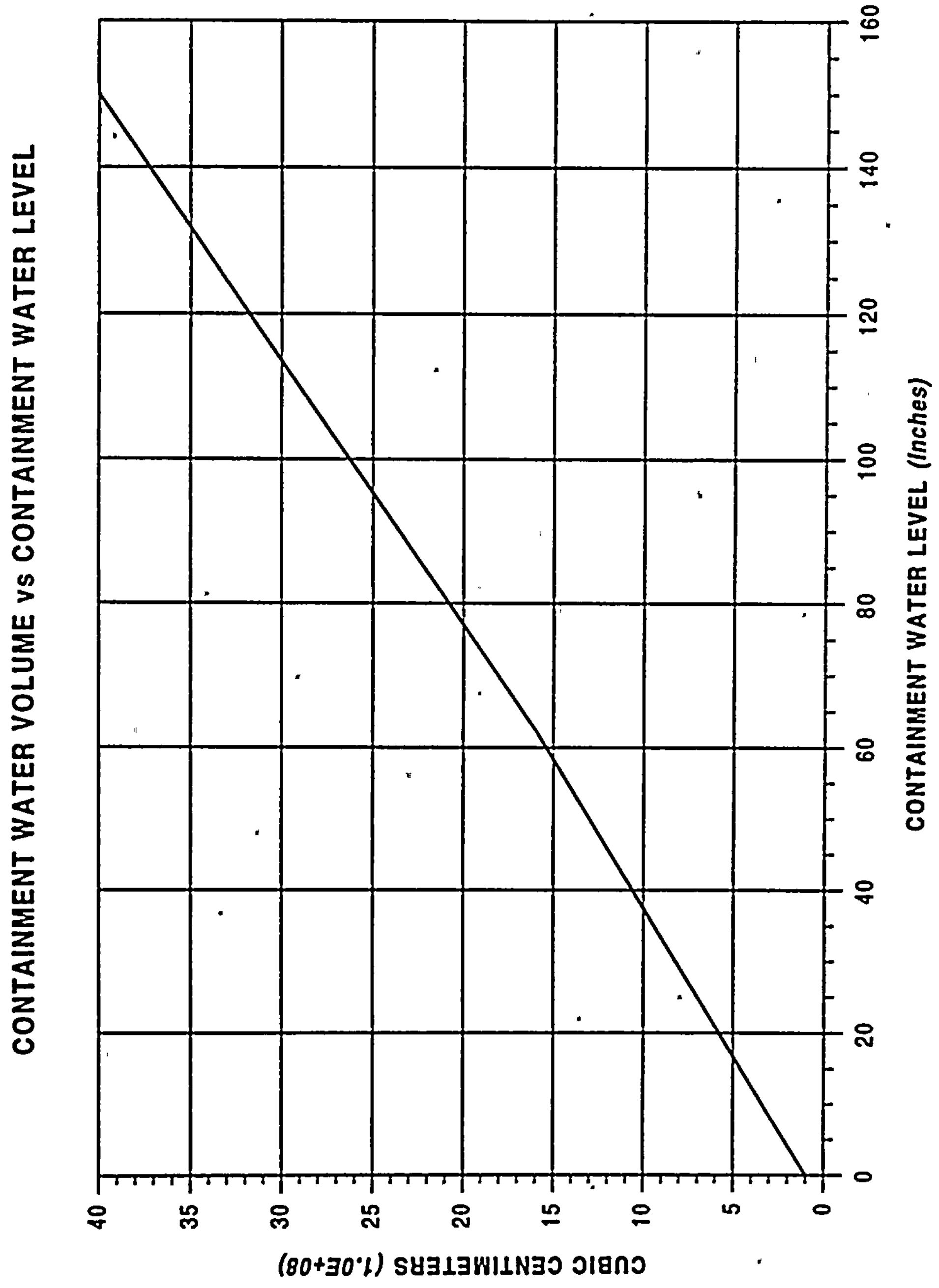
FIGURE 10

SAMPLE LOCATIONS APPROPRIATE FOR CORE DAMAGE ASSESSMENT

ACCIDENT SCENARIO	RCS HOT LEG	CONTAINMENT SUMP	CONTAINMENT ATMOSPHERE	SHUTDOWN COOLING
Small Break LOCA Reactor Power > 1%	YES	....	YES	YES
Small Break LOCA Reactor Power < 1%	YES	....	....	YES
Small Steam Line Break	YES	....	....	....
Large Break LOCA Reactor Power > 1%	YES	YES	YES	YES
Large Break LOCA Reactor Power < 1%	....	YES	YES	YES
Large Steam Line Break	YES	....	YES	....
Steam Generator Tube Rupture	YES	....	YES	....

8.12 Figure 11 - Containment water volume vs. Containment water level

FIGURE 11



Appendix H - Autodialer Activation

NOTE

If the declared emergency situation is terminated prior to activation of the autodialer, do not activate the autodialer. The Shift Manager / Emergency Coordinator will direct the use of the autodialer. If the autodialer cannot be activated from the PVNGS Technical Support Center, contact Emergency Planning for assistance.

1.0 Activating the autodialer.

1.1 Power up the autodialer unit.

1.2 When the "ATERM" screen appears, press <F2>.

1.3 At the "Enter Password" prompt, type mlog and press <ENTER>.

1.4 Select the "Administrator" option and press <ENTER>.

1.5 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.6 Type your password and press <ENTER>.

1.7 Scroll down slowly and highlight the appropriate option from the following choices:

1.7.1 Unit 1 Setup (for Emergency Response Notifications)

1.7.2 Station Setup (for Fire Department activation)

1.8 When the appropriate option is highlighted, press <ENTER>.

1.9 Highlight the appropriate selection from the following choices:

1.9.1 E (actual emergency) / (classification)

1.9.2 D (drill) / (classification)

1.9.3 T (test) / (classification)

1.10 When the appropriate selection is highlighted, press <ENTER>.

1.11 When the "Working - Please Wait" dialog box disappears, press <ESC> two times.

NOTE

There may be a file transfer operation at this point. In a case of the file transfer dialog on the screen, wait until file transfer is completed (dialog box disappears) before continuing on to next step.

1.12 Select the "Administrator" option again and press <ENTER>.

1.13 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

1.14 Type your password and press <ENTER>.

1.15 Select the appropriate designator from the following choices:

1.15.1 Emergency Activation

1.15.2 Drill Activation

1.15.3 Test Activation

1.16 When the appropriate option is highlighted, press <ENTER>.

1.17 Select the appropriate Unit and press <ENTER>.

CAUTION

Selecting the option "Yes" (Y) in the next step STARTS activation. There is no additional confirmation step to allow you to back out of an activation prior to its commencement if you select the "Yes" option.

1.18 At the prompt "You have selected system (Emergency/Drill/Test) Activation for (UNIT 1/2/3/PVNGS STATION) location. The system is not currently staffing. Are you certain that you wish to continue?", type Y (yes) or N (no).

1.19 Ensure that the system has been activated by verifying the appearance of status screens displaying Emergency Response Organization position information as responders are reached.

1.20 If the autodialer failed to activate or failed to complete the notification process, notify the Shift Manager / Emergency Coordinator that the autodialer in the Technical Support Center failed the activation process. If necessary, inform the Emergency Coordinator of the current status of the system.

2.0 Terminating the autodialer activation.

2.1 From the "Monitoring Staffing for Unit (1/2/3/PVNGS Station)", select <F2> "Stop Staffing".

2.2 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.3 Type your password and press <ENTER>.

2.4 A "Real Time" fax report dialog box will display followed by a "Working - Please Wait" dialog box. When the "Working - Please Wait" dialog box disappears, the "Monitoring Staffing" screen also disappears.

2.5 The main Coordinator screen appears with "(RE)ACTIVATED, NOT STAFFING" in the left side of the upper box on the screen.

2.6 Select the "Administrator" option and press <ENTER>.

2.7 At the prompt, type your Employee ID Number (without the leading letter) and press <ENTER>.

2.8 Type your password and press <ENTER>.

2.9 Select the "RESET" option and press <ENTER>.

2.10 After the "Working - Please Wait" dialog box disappears, press the <ESC> key once.

2.11 Select the <CTRL> + <RIGHT SHIFT> (Hold down the "control" key and simultaneously press the "Shift" key on the right hand side of the keyboard), to bring up the ATERM SPECIAL FUNCTIONS dialog box. Highlight "END ATERM SESSION" and press <ENTER>.

2.12 The ATERM Login screen should appear. This action terminates the modem session from the workstation to the Autodialer.

2.13 When emergency notifications have been completed, inform the Emergency Coordinator of any unaffirmed Emergency Response Organization positions.

Appendix I - Assembly

1.0 General information

1.1 Assembly is recommended at the Alert classification level unless the Emergency Coordinator is reasonably assured that the condition does not have the potential to further degrade. Accountability is required for a Site Area Emergency or a General Emergency and must be completed within 30 minutes following the request for Accountability. Accountability does not have to be performed immediately following the request for Assembly.

1.2 Designated Assembly Areas within the Protected Area are the Control Room/Satellite Technical Support Center, Technical Support Center, Operations Support Center, and Containment (Modes 5, 6, and Defueled, if appropriate). Designated Assembly Areas beyond the Protected Area are major buildings within the Owner Controlled Area having the capability of receiving Plant Paging System announcements.

1.3 Essential personnel are Emergency Response Organization personnel currently required for duty, and individuals engaged in Emergency Coordinator authorized critical work. If directed, essential personnel in an Unaffected Unit who normally respond to their Assembly Area will respond to the Affected Unit Assembly Area.

1.4 If the Security Computer System is not functioning, Security personnel will manually account for Protected Area personnel at Security Headquarters. Protected Area Assembly Area supervision will accommodate accordingly at each of their respective locations.

2.0 Emergency Coordinator actions

2.1 For Assembly/Accountability (required for SAE and GE, optional for Alert), perform the following:

2.1.1 Sound the Unit Assembly Signal for approximately 30 seconds.

2.1.2 Transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. An emergency situation classified as a ________________ exists in Unit ___. Assembly is required. All personnel report to your designated Assembly Area." Provide instructions on areas to avoid as appropriate.

2.1.3 Repeat sounding the Unit Assembly Signal and the message once. This responsibility can be delegated.

2.1.4 Direct the Security Director to complete supplemental onsite notifications and activate the autodialer (6470 / 6471 / 6472, 4444) or dedicated line or radio).

2.1.5 Personnel assembly is accomplished as follows:

2.1.5.1 Personnel in Containment are to secure work safely, report to the 140' hatch, and await instructions.

2.1.5.2 Emergency Response Organization members are to report to their Emergency Response Facilities.

2.1.5.3 Personnel in the Protected Area engaged in EC-authorized critical work are to report to the OSC, STSC, or TSC and card in on the ACAD card reader before returning to work.

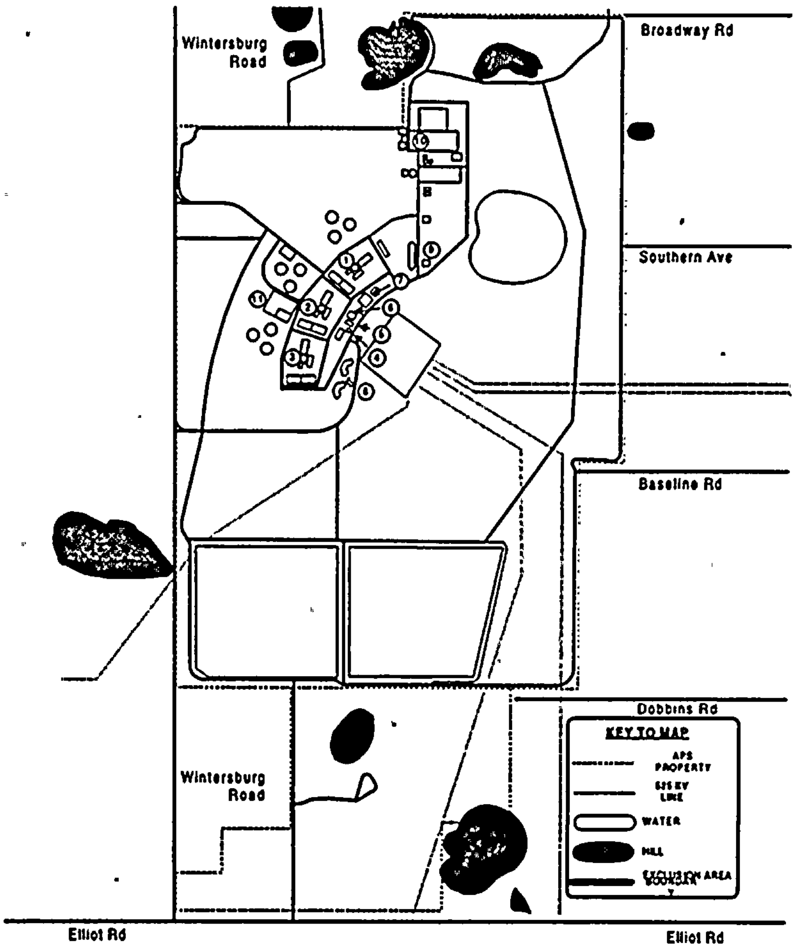
2.1.5.4 All other personnel, whether inside or outside the Protected Area., are to report to the nearest Assembly Area outside the Protected Area. These are considered to be non-essential personnel.

2.1.6 Ensure that assembling personnel each register their ACAD in the card reader. If the ACAD card reader is inoperable, direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms). Collect all forms and fax them to CAS.

2.1.7 To terminate Assembly by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.1.8 To terminate Assembly by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

The following site map details designated Assembly Areas to be used for assembling personnel when Assembly has been directed by the Emergency Coordinator.



Protected Area	Owner Controlled Area
1. Unit 1 Power Block	6. Building D
2. Unit 2 Power Block	7. Buildings E and F
3. Unit 3 Power Block	8. Buildings A, B, C
4. Security Headquarters	9. Transportation
5. Technical Support Center	10. Water Reclamation Facility Admin
	11. North Annex and Warehouse

2.2 If Accountability is to be conducted after Assembly, perform the following:

2.2.1 Request CAS Security personnel (6470 / 6471 / 6472, or 4444 or dedicated line or radio) to perform Accountability and to provide the report within 30 minutes.

2.2.2 Advise the Security Director to locate any unaccounted individuals.

2.2.3 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

2.2.4 Maintain continuous accountability of STSC personnel after Assembly. It is the position of PVNGS management that continuous accountability be maintained by knowledge of those individuals inside, and controlling access to, the Protected Area. Specific locations, i.e., Sector designation, of individuals inside the Protected Area may be ascertained by various methods, such as use of the Security Computer System and associated ACAD card readers, use of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms) in the OSC, Protected Area Assembly Area Supervisor knowledge, and Central Alarm Station (CAS) Operator knowledge. It is through a combination of these available administrative resources that continuous accountability of personnel inside the Protected Area can be maintained. The responsibility for maintaining continuous accountability of personnel within the envelope of each of the emergency response facilities within the Protected Area lies with the appropriate facility manager.

2.2.5 To terminate Accountability by having personnel return to work, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All personnel are to resume normal work activities."

2.2.6 To terminate Accountability by an early dismissal of personnel, transmit the following message over the Unit Evacuation System: "Attention all plant personnel. Attention all plant personnel. The Assembly process is complete. All non-essential personnel are released from work and may leave the site."

2.2.7 To terminate Accountability by a Site Evacuation, see Appendix J - Site Evacuation.

3.0 Security Director actions

3.1 When Assembly is directed, search the following areas in each Unit:

3.1.1 A-213 / A-217, CEDMCS Rooms

3.1.2 AC-04 / AC-13, Containment Spray Pump Rooms

3.1.3 AC-05 / AC-10, LPSI Rooms

3.1.4 AB-08, Gas Stripper Room

3.1.5 AB-02 / AB-10 / AB-11, 77' / 87' Mechanical Penetration Rooms

3.1.6 Y-105 / Y-106, 84' Pipe Density Tunnel

3.1.7 F-106, Fuel Cask Loading Area

3.1.8 R-211, 120' Radwaste Control Room

3.1.9 A-108 / A-109, 100' EW Heat Exchanger Rooms

3.1.10 A-124 / A-123, 88' Essential Pipe Chase

3.1.11 A-231 / A-232, Valve Gallery

3.1.12 A-210 / A-217 / A-218, Boron Injection Rooms

3.1.13 A-312 - R-303 - R-308, Waste Gas Panel Aisle

3.1.14 Y-101, 90' Nuclear Cooling Condensate

3.1.15 C-111, MSSS 100' Valve and Pipeway Area

3.1.16 Y-102 / Y-103, Spray Pond Pump Rooms

3.1.17 TSC Diesel Room

3.2 Search the following non-designated Assembly Areas and buildings outside the Protected Area for personnel:

3.2.1 Evaporation Ponds

3.2.2 SRP Switchyard

3.2.3 80-Acre Lake

3.2.4 Site Landfill

3.2.5 Neutrino Facility

3.3 When searches have been completed, advise Secondary Alarm Station personnel of the search status.

3.4 Lock down the Protected Area.

3.5 Notify the Water Reclamation Facility Control Room of the Assembly directive to ensure WRF personnel are notified to assemble.

3.6 Support the Emergency Coordinator with post-Assembly activities.

3.7 For Accountability, perform the following actions.

3.7.1 Ensure that the Emergency Coordinator receives a detailed Accountability report within 30 minutes following the request.

3.7.2 Using the Unit Evacuation System and/or the site-wide page, locate any unaccounted individuals identified on the detailed Accountability Report.

3.7.3 If necessary, coordinate with Fire Protection personnel to locate and assist unaccounted individuals identified on the detailed Accountability Report.

4.0 Assembly Area Supervision actions

4.1 Ensure assembling personnel each register their ACAD in the card reader.

4.2 If the ACAD card reader is inoperable, perform the following actions:

4.2.1 Direct all personnel to register their names and ACAD Numbers on Form EP-0561, Individual Accountability (see Appendix C - Forms).

4.2.2 Collect all forms and transmit them by facsimile (FAX 2687) to Security supervision.

4.3 If essential personnel are dispatched from an Assembly Area prior to completion of Accountability, account for them via one of the following methods (preferred listed first):

4.3.1 Transmit a copy of Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), by facsimile (FAX) to Security supervision.

4.3.2 Notify Security supervision by telephone 6470 / 6471 / 6472 of name and ACAD numbers for the appropriate individuals as listed on an Accountability Form.

4.4 If non-essential personnel have registered into a Protected Area Assembly Area and Accountability has been completed, notify the Security Director and request to arrange for transfer of these personnel to an appropriate Assembly Area.

Appendix J - Site Evacuation

1.0 General information

1.1 Although Site Evacuation is required at the General Emergency level, it is an option for the Emergency Coordinator to determine the need for and order a site evacuation of non-essential personnel at a less severe classification level. The Emergency Coordinator may also direct sheltering or an early dismissal of personnel prior to a danger of radiation exposure.

1.2 Personnel who are not identified as Emergency Response Organization staff members are considered non-essential. This excludes onsite and offsite assistance personnel who are currently engaged in emergency response activities in direct support of the Emergency Response Organization.

1.3 It is imperative that onsite organization efforts associated with the evacuation are completed prior to notification of all non-essential personnel by the Emergency Coordinator of the need to evacuate the site. Security personnel must be strategically located to effect an orderly evacuation. A disorderly evacuation could increase the potential for personal injury and site security efforts should be coordinated with local law enforcement agencies to lower this potential.

1.4 Buckeye Airport is the preferred reassembly area due to additional radiological support provided by the Arizona Radiation Regulatory Agency and additional security support provided by local law enforcement agencies.

2.0 Emergency Coordinator actions

2.1 After actions to organize the evacuation have been completed and security measures have been established, transmit the following message over the Unit Evacuation System:

"Attention all plant personnel. Attention all plant personnel. Site evacuation for non-essential personnel is required. Proceed to your own vehicles and follow the instructions from Security."

2.1.1 Sound the Site Evacuation Signal for approximately 30 seconds.

2.1.2 Repeat the message once. This responsibility can be delegated.

3.0 Radiation Protection Monitor / Radiological Assessment Coordinator actions

3.1 Consult with the Security Director / Security Coordinator to determine the evacuation route and site egress point.

3.2 Designate one or more radiological monitoring team(s) who will go to the Reassembly Area at Buckeye Airport to provide monitoring of personnel and vehicles.

3.3 In conjunction with the Security Director / Security Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

3.3.1 After the briefing, direct the radiological monitoring team(s) to take the following actions:

3.3.1.1 Obtain a copy of EPIP-06, Reassembly Area Operations.

3.3.1.2 Obtain two to four friskers (RM-20).

3.3.1.3 Obtain one to two dose rate instruments.

3.3.1.4 Obtain one two-way radio.

3.3.1.5 Obtain the Reassembly Area key.

3.3.1.6 Proceed immediately to the Reassembly Area at the Buckeye Airport using the appropriate site egress and evacuation routes.

NOTE

EPIP-06, Reassembly Area Operations, is designed to prepare the Reassembly Area for use in accordance with the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure. It should be utilized only for the time period prior to the arrival of state officials. Thereafter, the State of Arizona Standard Operating Procedure will be used to direct Reassembly Area Operations.

3.3.1.7 Upon arrival at the Reassembly Area, implement EPIP-06, Reassembly Area Operations, and transition to the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure upon arrival of state officials.

4.0 Security Director / Security Coordinator actions

4.1 Consult with the Radiation Protection Monitor / Radiological Assessment Coordinator to determine the evacuation route and site egress point.

4.2 The Security Director will complete supplemental onsite notifications prior to the Site Evacuation.

4.3 Inform Security supervision of the site egress and evacuation routes selected. Direct Security supervision to take the following actions and to report when completed.

4.3.1 Instruct a Security Officer to perform the following actions:

4.3.1.1 Obtain the emergency equipment for a Site Evacuation from Security Headquarters.

4.3.1.2 Prepare a selected Security vehicle (Security Shift Van preferred) with the emergency equipment.

4.3.1.3 Assume a strategic location at the designated site egress point.

4.3.1.4 Report when in position at the egress point.

4.3.1.5 Advise the CAS / SAS of status upon arrival at the Reassembly Area.

4.3.2 As determined by existing radiological conditions, direct Members of the Security Force to establish security measures and traffic flow requirements using personnel appropriately.

4.3.3 Advise local law enforcement agencies of the designated site egress point, the selected evacuation route, and the destination.

4.3.4 Contact the Water Reclamation Facility Control Room at Extension 3007 and inform the WRF Shift Supervisor of the need to evacuate the site, the designated site egress point, and to direct his / her personnel to load their vehicles to capacity and form a single line behind the lead Security vehicle at the designated site egress point.

4.4 In conjunction with the Radiation Protection Monitor / Radiological Assessment Coordinator, provide a briefing to the radiological monitoring team(s), Reassembly Team Leader(s), and the lead Security vehicle driver on the site egress and evacuation routes.

4.4.1 Direct the Reassembly Team Leader(s) to obtain emergency van key boxes for vans located in the Operations and North Annex parking lots from the Emergency Operations Facility Activation Room. The keys are to be dispensed only to those personnel requiring van keys.

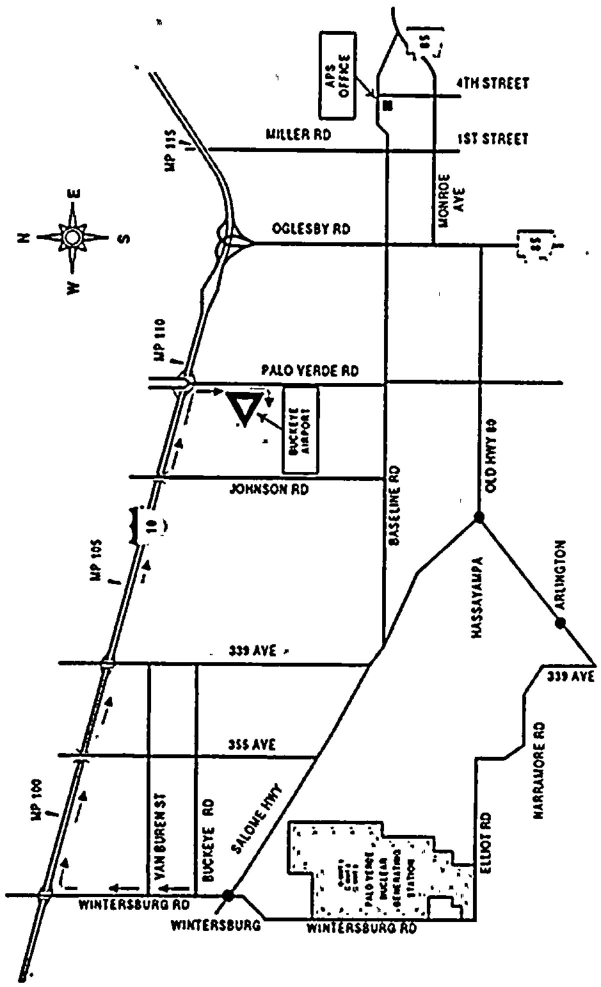
4.4.2 Direct the Reassembly Team Leader(s) to meet with the lead Security vehicle at the site egress point selected.

4.4.3 Direct the lead Security vehicle driver that when automobile and van drivers have formed a single line behind the lead Security vehicle at the designated site egress point, to proceed to the Buckeye Airport using the preselected evacuation route. Local law enforcement agencies will aid in the evacuation process, if required.

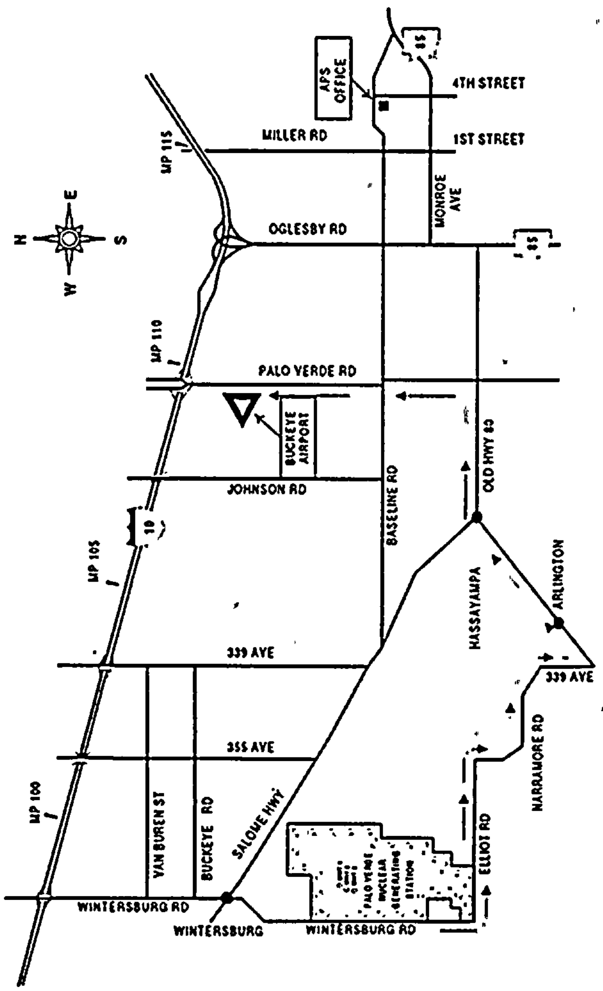
4.5 When the site has been evacuated, direct Security supervision to conduct searches of all buildings and areas outside the Protected Area for non-essential personnel.

5.0 Site Evacuation routes

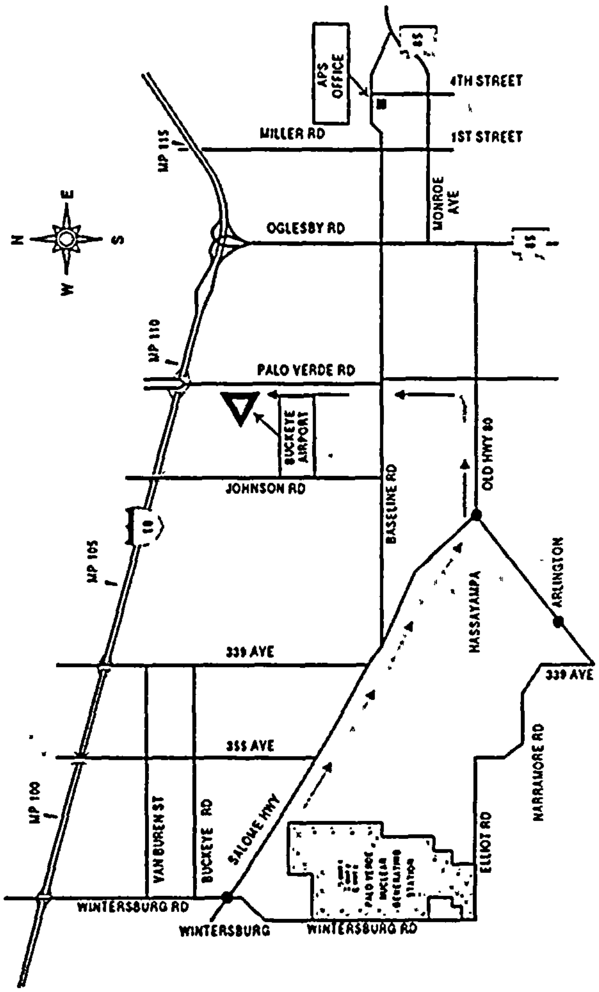
Site Evacution route #1



Site Evacuation route #2



Site Evacuation route #3



Appendix K - Emergency Exposures and KI

1.0 Introduction

1.1 Content

1.1.1 Planned Special Exposures, as defined in 10 CFR 20.1003 and 10 CFR 20.1206, are specifically excluded from guidance provided herein.

1.1.2 The instructions provided in this document assume that time is available for performing the appropriate sections. When circumstances dictate immediate actions, documentation associated with preliminary actions must be completed as soon as possible following those actions.

1.2 Noteworthy items

1.2.1 The Radiation Protection Monitor / Radiological Protection Coordinator shall advise the Emergency Coordinator on exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.2 The Emergency Coordinator shall authorize radiation exposures not subject to 10 CFR 20.1201(a) occupational dose limits up to the Emergency Exposure Limits specified in Section 2 of this document.

1.2.3 The Emergency Coordinator shall authorize use of Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM.

1.2.4 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be volunteers working under direct authorization of the Emergency Coordinator.

1.2.5 Emergency exposures associated with life-saving actions shall be limited to a single occurrence per lifetime.

1.2.6 Volunteers 45 years of age or older should receive primary consideration. When possible, the radiation exposure history of a volunteer should be researched and inspected prior to authorization. Minors are specifically excluded as volunteers.

1.2.7 Females shall not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

1.2.8 Personnel authorized to receive dose in excess of 25 REM or to use Potassium Iodide (KI) for projected Thyroid CDE doses in excess of 25 REM shall be briefed, if time permits, on hazards and potential consequences prior to performing activities associated with that authorization. In cases when immediate actions are required, verbal authorization may be granted provided that all documentation associated with the authorization is completed as soon as possible following the actions. In all cases, subsequent dose extensions will not be granted prior to completion of evaluation documentation associated with preceding dose extensions.

1.2.9 Minimum documentation required for individuals authorized to receive dose not subject to the 10 CFR 20.1201(a) limits shall include an appropriate Radiation Exposure Permit and a completed Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms). Minimum authorizing documentation for use of KI shall be a completed Form EP-0503, KI Distribution (see Appendix C - Forms).

1.2.10 Administrative methods to minimize personnel exposure (ALARA) should remain in force to the extent consistent with timely rescue and corrective / protective actions per appropriate Radiation Protection Procedures.

1.2.11 Follow-up monitoring of individuals issued KI must be performed (whether or not exposure to radioiodine occurred) due to possible side effects associated with KI. In cases where radioiodine exposure has been confirmed; monitoring is required to maintain the thyroid blocking action by additional KI doses.

1.2.12 All dose received, including dose not subject to (beyond) 10 CFR 20.1201(a) occupational dose limits, will need to be subsequently documented in accordance with 10 CFR 20.2106.

1.2.13 Compliance with 10 CFR 20 during emergencies, including 10 CFR 20.1201(a) dose limits, shall occur as standard practice. Emergency related evolutions shall have a specific purpose involving high-priority actions necessary to save life, protect workers or the public, limit radiological release, or place the plant in a more secure condition relating to the emergency (protecting the plant).

1.3 Discussion

1.3.1 This document provides for personnel dose exposure control only under emergency conditions. For non-emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, should be used. During declared emergency conditions, Procedure 75AC-9RP01, Radiation Exposure and Access Control, remains applicable with the following provisions:

1.3.2 The current PVNGS Administrative Exposure Hold Point RRACS values established for site personnel will remain valid and the system will be used as a dose control tool for all activities in all Units and in all facilities.

1.3.3 The Radiation Protection Monitor, Radiological Protection Coordinator, or Radiological Assessment Coordinator may verbally authorize higher PVNGS Administrative Exposure Hold Points up to the 10 CFR 20.1201(a) limits for any particular emergency response team members. Use of Appendix A, Request for a Higher Administrative Hold Point, of Procedure 75AC-9RP01, Radiation Exposure and Access Control, during a declared emergency condition will not specifically be required.

1.3.4 Whereas the 10 CFR 20 limits apply to non-emergency conditions, every effort will be made to observe these limits under emergency conditions. They may be exceeded, if necessary, on a case-by-case basis, but only with advance authorization.

1.3.5 The Emergency Coordinator must authorize any dose beyond those limits specified in 10 CFR 20.1201(a) when the dose is projected to be in excess of any of those limits.

1.3.6 Emergency situations may include corrective / protective action circumstances where a high exposure to several individuals may greatly reduce exposure to many. A life-saving situation could also incur exposure approaching lethal levels when attempted. However, the vast majority of emergency response activity may be accomplished well within normal radiation dose controls.

1.3.7 Reflecting on this concept, the Environmental Protection Agency's (EPA's) guidance specifies that in the absence of special situations (e.g., life-saving, etc.), the 10 CFR 20 limits should be followed. An activity to protect valuable property is limited to 10 REM when a lower projected dose is not practicable. Life-saving activities on a voluntary basis have no upper limit established, but are not performed without the appropriate conditions applied.

1.3.8 Palo Verde Nuclear Generating Station has adopted this EPA guidance for emergency workers.

2.0 Emergency Exposure Dose Limits

2.1 Notes

2.1.1 The RPM / RPC may authorize doses up to the 10 CFR 20 limits - the EC must authorize doses beyond the 10 CFR 20 limits.

2.1.2 "Protecting Valuable Property" includes equipment-saving measures as well as sampling, surveillance, or repair activities that, in the opinion of the Emergency Coordinator, constitutes plant protective measures.

2.1.3 The exposure that workers incur for the protection of large populations may be considered justified for situations in which the collective dose avoided by the emergency operation(s) is significantly larger than that incurred by the workers involved.

2.2 Dose Limit Determination

2.2.1 Use the following chart to determine dose limits for which authorization of dose extensions may be required:

DOSE LIMITS	TEDE	TODE	LDE	SDE	AUTHORIZATION REQUIRED BY:
10 CFR 20.1201 Limits *(EPA guidance for all workers in emergencies)*	5 REM per year	50 REM * per year	15 REM per year	50 REM per year	RPM / RPC up to these limits EC to go beyond these limits
EPA Guidance for Protecting Valuable Property	10 REM per event	100 REM per event	30 REM per event	100 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations	≤25 REM per event	≤250 REM per event	≤75 REM per event	≤250 REM per event	EC only *(when lower dose is not practicable)*
EPA Guidance for Life-Saving or Protection of Large Populations *(on a Voluntary Basis Only)*	> 25 REM per event	> 250 REM per event	> 75 REM per event	> 250 REM per event	EC only *(and a risk discusion must be conducted)*

* Sum of Deep Dose Equivalent and Committed Dose Equivalent (DDE + CDE). EPA does not use TODE (Total Organ Dose Equivalent); EPA uses CDE in this column. PVNGS assesses TODE and, via this Instructional Guide and subsequent Dosimetry follow-up, also assesses Thyroid CDE.

3.0 Thyroid CDE Risk Assessment

3.1 Outline

3.1.1 Use of this section assumes that conditions exist such that the probability for significant Iodine exposure is high. This section must initially be completed for each team and subsequently repeated for each team as conditions change. The sequence for radioiodine risk assessment will encompass the following actions:

1. Making a determination if the team's activity will be an Iodine concern
2. Determining Thyroid CDE dose rates for the team's work area
3. Performing a risk assessment for each team

3.2 Determining if Iodine is a concern.

3.2.1 Review internal plant conditions, component failure or leak areas, and external plume path conditions.

3.2.2 Instruct survey team(s) to obtain air samples in projected work areas and report the results of direct frisk readings on the particulate and Iodine media, in accordance with Form EP-0484, Air Sample Data (see Appendix C - Forms).

NOTE

The "µCi/cc" Iodine RMS channel indications on the RMS DCU or on ERFDADS cannot be used in the Field Sample Data Assessment for estimating Thyroid CDE rates. They represent accumulated, rather than current, airborne activity.

3.2.3 Review any alarming Radiation Monitoring System particulate, Iodine, and gas channels for indications of areas where other Iodine samples should be obtained.

3.2.4 For release path activity, collect appropriate particulate and Iodine samples, as necessary, from RMS Skids for counting on a multi-channel analyzer. If the sample volume is known, "µCi/cc" values may be obtained. Contact the Radiological Monitoring Technician as required.

3.3 Determining Thyroid CDE dose rates.

NOTE

A Thyroid CDE Dose Rate Estimate can be determined by using either the MESOREM printed report or field samples. The MESOREM printed report will provide recommendations to administer KI in affected sectors if the projected Thyroid CDE dose at the Site Boundary for the duration of the projected release time is > 25 REM. Additional Thyroid CDE dose rates will be provided for 2, 5, and 10-mile centerline distances. Field samples will provide more reliable data which can be used for the dose rate determination. For this reason, field samples are preferred when time is available.

3.3.1 For rate estimates using the MESOREM printed report, perform the following:

3.3.1.1 Review the 2, 5, and 10-mile Thyroid CDE dose rates and evaluate the dose where ARRA and RFAT Teams are expected to be operating. Since time is required for review and approval of data by the RAC, this process may not be applicable to the RPM.

3.3.1.2 For onsite receptors, review the "MAX" Thyroid CDE Dose Rate, which is calculated for a distance of 0.25 miles from the release point.

NOTE

The following applies to readings taken on Silver Zeolite (AgX) cartridges: On-scale frisker readings result in no requirement to administer KI. Full-scale frisker readings, i.e., 500,000 cpm, correlate to 1.6E-05 µCi/cc activity, which corresponds to slightly under 21 REM / hour. A frisker reading of 625 cpm correlates to the DAC limit of 2.0E-08 µCi/cc. On-scale RO-2 (closed window) readings of 3 mrem / hour at 1 hour into the event (after reactor scram) correlate to 6.0E-06 µCi/cc I131 equivalent, corresponding to approximately 8 REM Thyroid CDE / hour.

3.3.2 For rate estimates using field sample data, perform the following:

3.3.2.1 Obtain the I131 equivalent µCi/cc values from field team personnel. As time permits, obtain isotopic analysis results of the samples.

3.3.2.2 Direct the field teams to obtain additional samples needed to back-calculate and update dose projections until agreements in data are reached between projections and field samples. Data obtained via this process may be used for locations where no data is available.

3.3.2.3 Using the data obtained from onsite / offsite field samples, determine the Thyroid CDE dose / dose rates by multiplying the Iodine concentration from the Air Sample Data form (as reported by the field team) by 1.3E+06. The result is the equivalent Thyroid CDE dose rate in REM / hour. This calculation may also be executed on Form EP-0481, Air Sample Data (see Appendix C - Forms).

3.3.3 Determine the most accurate Thyroid CDE dose rate estimate from the review of all available data.

3.4 Performing a Team Risk Assessment.

NOTE

This process requires frequent performance during an emergency event when workers may be exposed to Iodine activity. Log entries should be used as documentation for the ongoing review process. Assessments should be as accurate as possible without resulting in over-conservative measures.

3.4.1 Determine the estimated stay time for the individual / team in the Iodine environment.

3.4.2 Select the most appropriate Thyroid CDE dose rate per the available data for the Iodine environment which will be entered.

3.4.3 Multiply the Thyroid CDE dose / hour by the estimated stay-time (in hours) to derive the estimated dose without application of protection factors.

3.4.4 Determine applicable protection factors of the protective equipment that will be used.

3.4.5 If the protection factors can be used to compensate for protective equipment, correct the estimated dose for the appropriate protection factor.

NOTE

Risk from a thyroid dose > 25 REM CDE warrants dispensation of KI.

3.4.6 If the net estimated dose is clearly < 25 REM Thyroid CDE, no further action is required.

3.4.7 If the net estimated dose is near or > 25 REM Thyroid CDE, proceed to Section 5 of this document, Potassium Iodide Administration.

3.4.8 Ensure the individual / team is appropriately briefed per Section 6 of this document, Team Briefing and Deployment.

4.0 **Emergency Exposure Authorization**

4.1 Preparing the authorization.

NOTE

This section requires documentation based on a review of the radiological evaluation of the situation requiring potential emergency exposure.

4.1.1 Perform a radiological evaluation of the situation that requires potential emergency exposure.

4.1.2 When the radiological evaluation has been reviewed, retrieve Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

4.1.3 On Form EP-0300 (see Appendix C - Forms), the ORIGINATOR Section shall be completed by the RPM / RPC (or staff), adhering to the following guidelines:

4.1.3.1 Team personnel are volunteers working under direct authorization of the Emergency Coordinator.

4.1.3.2 Females will not be allowed to exceed dose limits specified on their applicable Prenatal Dose Limit Statements.

4.1.3.3 Personnel have been made aware of potential hazards associated with exposure received under emergency conditions.

4.1.3.4 The individual current exposure status of each team member has been (will be) examined and is (will be) known.

4.1.3.5 Volunteers 45 years of age or older have been given primary consideration.

4.1.3.6 Emergency exposures associated with life-saving actions will be limited to a single occurrence per lifetime.

4.1.3.7 Team members consist of the most qualified individuals.

4.1.4 On Form EP-0300 (see Appendix C - Forms), indicate clearly in the "Reason for Request" area that an Emergency Classification has been declared and add the reason for team entry.

NOTE

On Form EP-0300 (see Appendix C - Forms), all signatures designate acceptance of the necessity to conduct a risk discussion, as time permits, with all workers authorized dose extensions for life-saving efforts, i.e., those pertaining to the lower two categories of the Emergency Exposure Dose Limit Chart in Section 2.2 of this Appendix. The review will encompass the risk review data from Section 6.1 of this Appendix.

4.1.5 The Radiation Worker shall sign on the appropriate line(s) in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms).

4.1.6 The RPM / RPC shall sign on the appropriate line in the AUTHORIZATION AND APPROVAL Section of Form EP-0300 (see Appendix C - Forms) and attach to the form any documentation of radiation surveys, etc. (if time permits) which were used for the radiological evaluation previously completed.

NOTE

The Emergency Coordinator has sole authority to approve radiation exposures beyond the 10 CFR 20 radiation exposure limits up to the Emergency Exposure Limits specified in Section 2.2 of this document.

4.1.7 If deemed appropriate, the Emergency Coordinator will approve (authorize) the request for the limit(s) desired per the Emergency Exposure Dose Limits specified in step 2.2 of this document.

4.1.8 The RPM / RPC shall follow up on emergency exposure for each individual per section 7.1.

5.0 Potassium Iodide Administration

5.1 Dispensation of KI.

NOTE

For the most effective utilization, KI should be administered at least one-half hour prior to anticipated Iodine exposure. However, KI will maintain substantial benefit even when taken three or four hours following acute Iodine exposure.

5.1.1 Obtain required approval for KI administration from the EC.

5.1.2 Ensure that the Emergency Exposure Authorization has been completed. TEDE and TODE limits and required approvals for exceeding dose limits must be established coincident with approval for the administration of KI.

5.1.3 Initiate documentation for each individual authorized KI administration by using one Form EP-0503, KI Distribution (see Appendix C - Forms), for each worker. Though not mandatory, record individuals' HPID Numbers and dates-of-birth on the forms.

5.1.4 If verbal approval is necessary, annotate "per telecon by (your name)" and sign the form as indicated.

5.1.5 Ensure a team briefing on the possible side-effects of Potassium Iodide, i.e., summarization of information on Form EP-0503 (see Appendix C - Forms), is conducted prior to the administration of KI to these individuals.

5.1.6 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one tablet to each individual authorized KI. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

5.1.7 The RPM / RPC shall follow up on KI administration for each individual per section 7.1.

6.0 Team Briefing and Deployment

6.1 Risk discussion criteria

6.1.1 Review the following information with all personnel who have been authorized emergency exposures in excess of 25 REM:

RISK REVIEW INFORMATION

Health Effects Associated with Whole Body Absorbed Dose Received Within a Few Hours	Whole Body Absorbed Dose *(RAD)*	Early Fatalities *(percent)* 2	Whole Body Absorbed Dose *(RAD)*	Prodromal Effects *(percent affected)* 3
(see EPA-400 Appendix B) 1	140	5	50	2
	200	15	100	15
	300	50	150	50
	400	85	200	85
	460	95	250	98

1 Risks will be lower for protracted exposure periods.
2 Supportive medical treatment may increase the dose at which these frequencies occur by approximately 50 percent.
3 Forewarning symptoms of more serious health effects associated with large doses of radiation.

Approximate Cancer Risk to Average Individuals from 25 REM Effective Dose Equivalent Delivered Promptly	Age at Exposure *(years)*	Approximate Risk of Premature Death *(deaths per 1000 persons exposed)*	Average Years of Life Lost if Premature Death Occurs *(years)*
(see EPA-400 Appendix C)	20 to 30	9.1	24
	30 to 40	7.2	19
	40 to 50	5.3	15
	50 to 60	3.5	11

Threshold Dose Levels for Acute Doses

	Effect	Threshold Organ Dose
The threshold effect is a concept for defining a minimum acute organ dose above which the described effect will *(not may)* occur in the exposed individual, although the occurrence may come later. It is not a risk estimate. It is a minimum level of detectability from a limited number of observations, so threshold values for humans are approximate values -- not absolute numbers.	Suppressed Sperm Coun	10 REM
	Damage to Fetus	10 REM *(but high risk of mental retardation requires use of a lower limit)*
	Thyroid Function Impaired	200 RAD
	Thyroid Made Hypothyroid	3,000 - 10,000 RAD
	Cataracts	500 - 1,200 RAD
	Skin Reddening	300 - 800 RAD
	Skin with Oozing Lesions	1,200 - 2,000 RAD

Organ systems are not expected to show symptoms of severe clinical pathophysiology for acute doses below a few hundred RAD. For additional information, see EPA-400 Appendix B.

6.2 Dispatching the team.

6.2.1 Inform the team leader(s) that dose authorization approvals are complete

6.2.2 Ensure that Radiation Protection personnel have a clear understanding on established dose limits and team entry abort points.

6.2.3 Dispatch the team.

NOTE

If the computerized dose tracking system (RRACS) is inoperable, dose records must be updated manually and annotated in the DOSIMETRY RECORD UPDATE Section of Form EP-0300, Authorization for Dose Beyond 10CFR20 Limits (see Appendix C - Forms).

6.3 Request the RPM / RPC / RAC to update RRACS. (This action may be completed during or after the entry). If Dosimetry personnel are not available, obtain the sealed "Emergency Dose Authorization Package" from an Operations Support Center Emergency Kit. Open the envelope and follow the instructions inside, using the supplied RRACS password to gain access to the system and update the hold point with the new authorized limit.

7.0 Subsequent Actions

7.1 Emergency exposure follow-up

7.1.1 Upon return of team members, collect all dosimetry for evaluation.

7.1.2 Ensure all team members are not deployed for further work until exposure evaluations have been completed.

7.1.3 Retrieve Appendix B, Record Exposure Evaluation, of Procedure 75RP-9ME23, Lost or Damaged Dosimetry, and initiate actions to complete the form.

7.1.4 Transmit all thermoluminescent dosimetry (TLDs) to Dosimetry for evaluation. Include information regarding which individuals require expedited dose reports.

7.1.5 During RRACS record update, ensure appropriate dose limits are reset to normal levels. Dosimetry personnel will complete the RECORDS UPDATE Section of the Record Exposure Evaluation Form.

7.1.6 Conduct a team debriefing at the conclusion of the job evolution and when exposure evaluations have been initiated.

7.1.7 Report any exposures authorized by the EC and received by team members to the Emergency Coordinator / Emergency Operations Director.

7.1.8 Ensure that the EC initiates actions to complete USNRC notifications of radiation exposures per 75AC-9RP04, Radiological Reports, if appropriate.

7.2 KI administration follow-up

NOTE

Performance of this section assumes personnel from Dosimetry, Medical, and Radiation Protection are available for support efforts.

7.2.1 Obtain a supply of 130 mg KI tablets from the Emergency Kit and issue one (1) tablet to each individual authorized KI every 24-hours for three (3) days. KI is maintained in the following Emergency Kits: all STSCs, all OSCs, TSC, EOF, all RFATs, and the offsite decontamination points.

7.2.2 Consult the Medical Department and determine if the need exists for extended KI administration periods by evaluating radiological exposures. In unusual circumstances, KI may be issued for a period of up to ten days. The Medical Department will provide KI dispensing instructions and will supervise KI administration.

7.2.3 Continue the monitoring of personnel for side-effects to KI and/or any radioiodine exposures that may have occurred.

7.2.4 When required documentation on each Form EP-0503, KI Distribution (see Appendix C - Forms), has been completed, forward the completed forms to Dosimetry. These forms become part of each individual's exposure history.

Appendix L - Accident Sampling

1.0 Introduction

1.1 Applicability

This Appendix is applicable to obtaining, handling, analyzing, and reporting samples pertaining to accident conditions in accordance with the requirements specified in NUREG-0654 and NUREG-0737. It provides the methodology for analysis of reactor coolant liquid, safety injection liquid, and Containment atmosphere samples. In addition, the document functions to provide instructions for RMS effluent sampling from the Plant Vent and Fuel Building Exhaust high range monitors for particulate and Iodine activity. Chemistry will usually be responsible for performance of this procedure with assistance from Operations and Radiation Protection personnel.

1.2 Prerequisites

Direction has been authorized and received for initiating the actions necessary to obtain accident sampling and analysis.

1.3 Precautions - general

1.3.1 Sampling activities require review of current and potential radiation and airborne activity to determine if actions associated with emergency exposures or issuance of KI need to be implemented.

1.3.2 When practical, the use of remote tools and shielding to minimize radiation exposure should be accomplished.

1.3.3 Monitoring for explosive atmospheres should be performed whenever plant, fuel, or sampling conditions indicate actual or potential elevated Hydrogen levels.

1.3.4 If possible, the sample should be counted in an Affected Unit laboratory. An Unaffected Unit laboratory should be prepared for analysis if conditions preclude counting in the Affected Unit laboratory.

1.3.5 Samples acquired during and after accident conditions should not be disposed of or destroyed without prior approval of the Chemistry Coordinator or the Emergency Coordinator.

1.4 Precautions - PASS inoperable

1.4.1 74DP-9CY02, Post-Accident Sampling System Program, provides direction for alternate sampling capability in the event that PASS becomes inoperable. Further direction is contained in 74OP-9SS05, Preplanned Alternate Sampling, which provides specific alternate sampling and collection methodology. The guidance in these procedures should be used in conjunction with this document for sample handling, control, and analysis.

1.4.2 When using the Preplanned Alternate Sampling methodology, dose rates and airborne activity will vary considerably, depending on plant conditions.

1.4.3 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, is based on using a PASS which is operable. The calculation assumes the CEDE dose to be negligible relative to the DDE.

1.4.4 Calculated data is not provided for specific Preplanned Sampling events beyond the data developed for PASS sampling for the following reasons:

1.4.4.1 In a Loss-of-Power (LOP) condition, the potential for localized airborne hot spots is high because ventilation / filtration will not be operating. The natural ventilation flows and flow paths resulting will be unpredictable.

1.4.4.2 Under abnormal plant conditions in which PASS is not operable, travel paths to and from sample areas, stay times in those areas, and plant conditions could vary widely from the projected calculated data comprising Section 9.0 of this document.

1.4.4.3 Use of supplied air, Self-contained Breathing Apparatus (SCBA), and/or other use of respiratory protection will most likely be required under accident conditions, as implementation of the procedure indicates significant plant conditions exist. The CEDE dose component may be crucial.

1.5 Precautions - RMS skid and sampling activity

1.5.1 Due to the potential for fluctuating area and release stack dose rates under accident conditions, the Chemistry and Radiological Monitoring Technician must maintain the Radiation Protection Monitor and Operations Support Center staff aware of their work areas and expected stay times to allow for dose control.

1.5.2 Dose rates and/or conditions may preclude accomplishing scheduled tasks. These conflicts should be brought to the attention of the Emergency Coordinator and Chemistry Coordinator for resolution.

1.6 Precautions for Chemistry Technician / Radiological Monitoring Technician

1.6.1 Sampling activities under emergency conditions prior to activation of onsite facilities will be authorized by the Onshift Organization - sampling activities under emergency conditions following activation of onsite facilities will be authorized by the Onsite Organization.

1.6.2 Prior to sampling work activities, all applicable technicians must sign the Emergency Radiation Exposure Permit and participate in a briefing conducted by Operations Support Center staff on current and expected conditions.

1.6.3 A working area telephone number should be provided to the Operations Support Center Coordinator and to the Chemistry Coordinator in the Technical Support Center. Available FAX machines may be utilized for additional communications with Technical Support Center staff.

1.6.4 During sampling activities, the Chemistry and/or Radiological Monitoring Technician should provide verbal updates to the Radiation Protection Technician, concentrating on actions which may cause a change in radiation levels.

1.6.5 Consider raising the alarm setpoints on RU-23, RU-26, and/or RU-158D commensurate with expected area dose rates. Consider isolating the taps on RU-9 and RU-10 to obtain representative sampling of a particular area, i.e., isolating RU-10 to monitor only the Chemistry Hot Lab area during sampling.

1.6.6 Verify the current operability of the sampling area ventilation system.

1.7 Precautions for Radiation Protection Technician

1.7.1 A determination must be made regarding protective equipment and area entry requirements prior to commencement of any sampling work. As soon as personnel are identified, extremity thermoluminescent dosimetry (TLD) packets should be prepared to avoid any delays in the sampling evolution.

1.7.2 Critical steps in the procedure should be reviewed with assigned personnel and expected stay times, sample exposure times, and critical areas should be determined. Expected exposures should be ascertained when reviewing available survey data, plant conditions, and RMS indications. Additional surveys should be obtained, if necessary. An RO-7 can be used to monitor dose rate changes in front of septum ports in extreme dose conditions.

1.7.3 Exposure limits, dose extensions, Potassium Iodide administration, and approvals can be obtained from the Radiation Protection Monitor / Radiological Protection Coordinator. If necessary, process additional exposure authorizations and/or KI distribution documentation (see Appendix K - Emergency Exposures and KI, and contact the RP Monitor for guidance). Ensure all documentation, including RRACS entries, are complete prior to proceeding with sampling evolutions.

1.7.4 A Radiation Exposure Permit should be prepared for all assigned sampling activities. Form EP-0131, In-plant Team Briefing (see Appendix C - Forms), will aid in assurance that radiological controls and directions are established.

1.7.5 The calculated data (PASS Dose Information / Thumb Rules) in Section 9.0 of this document, Sample Data Reference, and the Briefing Guidelines in section 2.0 should be reviewed with all team members prior to dispatch.

1.7.6 Ensure that all samples collected are labeled, stored, and posted in accordance with 75RP-9RP15, Control and Storage of Radioactive Material.

1.8 Precautions - Chemistry Leader / Chemistry Coordinator

NOTE

The Chemistry Coordinator will function from the Technical Support Center following that facility's activation. Prior to activation, direction and/or recom-mendations may be obtained via telecommunications from an offsite Chemistry Leader if specific Chemistry information and/or direction is necessary.

1.8.1 The Chemistry Leader / Chemistry Coordinator should ensure that all personnel assigned duties regarding sampling and analysis are qualified and experienced on system operations.

1.8.2 In coordination with the Emergency Coordinator and Shift Technical Advisor / Reactor Analyst, the Chemistry Leader and/or Chemistry Coordinator should determine the samples required and the sampling priorities for current plant conditions. Consideration of and planning for RMS high range skid sampling options (3 P/I configurations are available), sampling per the Preplanned Alternate Sampling options, PASS sample options, and other RMS samples available should be included.

1.8.3 Analytical equipment required to analyze a post-accident sample should be prepared at an Alert, or higher, emergency classification, whether or not a post-accident sample has been requested. If radiation levels are prohibitive in the Affected Unit, preparations should be started in an Unaffected Unit.

1.8.4 Consideration should be given to allow at least 2 hours to elapse after a reactor trip prior to isolating a PASS RCS or Containment atmosphere sample:

1.8.4.1 2-hour decay could decrease local radiation levels by 2-2½ times

1.8.4.2 3-hour decay could decrease local radiation levels by up to 10 times

1.8.5 Containment and Auxiliary Building sump liquids may exhibit higher-than-normal radiation levels during accident conditions.

1.8.6 The Auxiliary Building sumps automatically pump to the TDS Tanks to prevent flooding and subsequent loss of the HPSI, LPSI, and CS Pumps. If RCS leakage to the Containment or Auxiliary Building sumps exists in conjunction with elevated RCS activity, monitoring and planning will be required for the extreme activity potential that can be transferred to the TDS Tank area outside of the Radwaste Building.

1.8.7 Safety Injection liquid samples can be used to estimate the Containment sump activity levels after a Recirculation Actuation Signal (RAS) has occurred or if the plant has been cooled down and Shutdown Cooling has been placed into service.

1.9 Precautions - Radiation Protection Monitor (RPM) / Radiological Protection Coordinator (RPC)

1.9.1 The RPM should direct, review, and monitor the actions of the Radiation Protection staff to ensure adequate pre-job surveys, REPs, and team briefings are provided for all sampling teams. The PASS Dose Information / Thumb Rules in section 9.0 and the Briefing Guidelines in section 2.0 of this Appendix should be used.

1.9.2 If exposures due to sampling activities are expected to approach or exceed those specified in 10 CFR 20.1201(a) or if high Iodine activity is potentially present, recommendations should be made to the Emergency Coordinator to implement guidance associated with Appendix K - Emergency Exposures and KI.

1.9.3 Communications between the Chemistry and Radiological Monitoring Technicians and the Operations staff should be maintained to ensure that changing plant conditions are understood and properly confirmed during all sampling activities. Any changes that occur to either monitored or unmonitored release pathways should be taken into account from an offsite perspective. Any changes that occur to onsite RCA boundaries due to internal and external dose limitations should also be considered as plant conditions change.

2.0 Sampling Briefing and Preparation

2.1 Briefing guidelines

The following Sampling Team Briefing Guidelines should be used when conducting the In-plant Team Briefing prior to sampling activities:

2.1.1 As a minimum, extremity dosimetry shall be placed on the middle finger of anyone handling sample tools or samples. Extremity dosimetry shall be utilized for Chemistry personnel working directly in front of septum ports on the Post-Accident Sampling System (PASS) or Radiological Monitoring (RM) Technicians collecting samples from Radiation Monitoring System (RMS) high range skids. Extremity dosimetry should be issued in accordance with site dosimetry procedures.

2.1.2 Due to the speed with which an accident sample is drawn, the RP Technician will probably not have sufficient time to collect an air sample and have it counted before the time at which the accident sample is drawn. Nor is there expected to be significant airborne activity released from the sample when using the PASS unit. Despite this assumption, an air sample should be prepared and run during the sampling activity to allow for the unexpected. RU-10 should be monitored constantly by the RM Technician. Preplanned Alternate Sampling activities will require additional actions based on implementation of section 7.0, Preplanned Alternate Sampling.

2.1.3 Proper labeling of samples with applicable times related to events will be crucial to the ongoing response to the emergency. All labeling activities should be performed from the long-term impact perspective. If extreme sample activity precludes labeling samples directly, the RP Technician shall ensure that outer postings are complete and that they provide direction for control of the samples.

2.1.4 The accident sampling team should thoroughly discuss each planned sample activity by stepping through this document and verbalizing the intent of each step and what is required to perform that step. Equipment should be verified available prior to starting actual sample collection. Plan for the unexpected; discuss what to do if a sample is dropped, a glass syringe breaks, etc. Any system breach will cause an immediate significant increase in Noble Gas activity.

2.1.5 The accident sampling team shall immediately inform the Operations Support Center Coordinator and the Chemistry Coordinator of significant problems or changes to the expected conditions as addressed in this briefing and on the REP.

2.1.6 The accident sampling team shall review the information comprising the PASS Dose Information / Thumb Rules in section 9.0 of this procedure, Sample Data Reference, prior to the start of sampling. All accident sampling team members shall also review current RMS indications. Preplanned Alternate Sampling teams shall employ continual RMS monitoring during all sampling evolutions.

2.1.7 When possible, use remote tools to handle high activity samples during sampling and analysis to provide maximum distance from the source. Maintain personnel exposures ALARA by observing all necessary precautions based on existing conditions.

2.1.8 The travel routes to and from the sample area should be reviewed to minimize dose. The route should be monitored for changes by OSC staff after an accident sampling team is dispatched.

2.1.9 Monitoring for an explosive atmosphere should be performed whenever plant / sampling / fuel conditions indicate elevated Hydrogen activity.

2.2 Preparing resources

NOTE

Emergency conditions may require immediate actions. If all actions outlined in the remainder of this Section cannot be completed prior to team dispatch, they may be completed in parallel with or as soon as possible following team dispatch.

2.2.1 When the team briefing has been completed and documented, ensure that all appropriate personnel data have been recorded on the applicable REP and have been entered into RRACS accordingly.

2.2.2 Ensure that all specified dosimetry and protective equipment has been issued.

2.2.3 Ensure that all RP pre-job surveys are complete and that preliminary postings are in place as required.

2.2.4 Ensure that the Chemistry, RP, and RM Technicians have each reviewed the actions in this document relative to critical hold points and that each has reviewed their planned sample survey and handling techniques in accordance with the Briefing Guidelines in section 2.0 and the PASS Dose Information / Thumb Rules specified in section 9.0 of this document.

2.2.5 Direct each accident sampling team member to perform an initial RMS review.

2.2.6 Instruct the RM Technician to monitor for unexpected changes on monitors near the sampling areas and near routes leading to and from the sampling areas.

NOTE

The choice of sampling method to be used is based on dose potential rather than on event categorization. Normal sampling systems may be employed under emergency conditions until or unless the dose potential mandates otherwise.

2.2.7 Based on sampling requirements, ensure that one of the following actions has occurred:

2.2.7.1 The Chemistry Technician has prepared either Chemistry Cart #1 or Chemistry Cart #2 for PASS sampling. Form EP-0051, Chemistry Cart #1 Preparation Checklist (see Appendix C - Forms), or Form EP-0052, Chemistry Cart #2 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.2 The Radiological Monitoring Technician has prepared Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

2.2.7.3 The Chemistry Technician has prepared equipment per the requirements specified in 74OP-9SS05, Preplanned Alternate Sampling (PASS is inoperable and PASP has been initiated.)

NOTE

Initially, two 1-inch attenuator blocks are used for the liquid and gas isotopic sample analyses. Initially, six 1-inch attenuator blocks are used for the particulate and Iodine sample analyses and the number of attenuator blocks are decreased, if necessary.

2.2.7.4 Verify that an efficiency calibration for necessary attenuators has been performed in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System, for each detector to be used. A PASS detector is any predefined detector which has been calibrated and verified using lead attenuators or collimators within 25% of certificate activity in accordance with 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.5 Verify that calibrations have been performed on the Multi-Channel Analyzer (MCA), Autotitrator, Ion Chromatograph, and Gas Chromatograph and that they meet the criteria specified in 74DP-0CH02, Instrument Performance Monitoring.

2.2.7.6 If the Gas Chromatograph is to be used, ensure that the exhaust is directed to an operating vent fan.

3.0 PASS depressurized liquid sampling

3.1 Preparing for sample collection

3.1.1 Place the temporary syringe disposal shield inside the sample room.

3.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

NOTE

During sample recirculation, an increase in activity may be observed on RU-26, on RU-158 CH-4 (Chemistry Sample Room), and on RU-155 CH-3 (77' West Penetration Room). Samples in Units 2 and 3, with the exception of Containment atmosphere, recirculate coolant immediately from the 77' elevation West Penetration Room to the Chemistry Primary Sample Room. Containment atmosphere samples are first recirculated locally to the 77' elevation West Penetration Room and then are directed to the Chemistry Primary Sample Room in a recirculation phase. In Unit 1, all samples progress through local recirculation before they are directed to the Chemistry Primary Sample Room.

3.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Technician, and the OSC Coordinator that PASS is in sample recirculation.

3.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

3.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

3.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

3.1.6.1 Special concern should be placed on streaming from the septum ports, approximately 6 inches from the floor, and directly in front of the sample sink.

3.1.6.2 Ask the Chemistry Technician which septum port is appropriate prior to entering the sample room.

3.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing.

3.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document.

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 0.5 ml of sample.

Analysis to be Done	Volume Needed	IAW
Gamma Isotopic	0.1 ml	74CH-9XC50
B	0.3 ml	74CH-9ZZ06
Cl	0.1 ml	74CH-9ZZ72

3.1.6.5 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines.

- Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

3.1.6.6 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

3.1.6.7 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

3.1.6.8 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

3.2 Collecting the sample

NOTE

A 1-ml liquid syringe of primary coolant, collected 2 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 780 REM / minute contact, and will decrease to 80 REM / minute at 6 cm (2.4 inches).
The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

3.2.1 Using the equipment previously staged on Chemistry Carts #1 and #2, place a 3½-ml liquid vial into the 2-inch thick lead pig.

3.2.2 Position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

3.2.3 Using the remote tool, place the syringe into the liquid sample port guide tube assembly.

3.2.4 Quickly and carefully, withdraw the desired sample volume into the syringe.

3.2.5 Remove the syringe from the sample port and carefully dispense the entire volume into the 3½-ml vial contained in the lead pig.

3.2.6 Place the empty syringe into the temporary syringe disposal cask with the point of the needle down.

3.2.7 (The RP Technician shall) take the dose rate reading at the top of the vial prior to dilution. This reading will be used for subsequent dilution calculations.

3.2.8 Prepare one piece of parafilm measuring 2-inch by 2-inch. Do not remove the backing paper from the piece of parafilm.

3.2.9 Place the piece of parafilm with the backing paper facing down over the vial containing the sample.

3.2.10 Install and latch the lead pig lid and move to a low dose area, as required.

3.2.11 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0 of this document, Sample Transportation. Otherwise, continue in this Section.

3.2.12 Monitor the background dose from the cart when working on dilution activities for isotopic analysis to ensure that Chemistry Count Room operations are not affected.

3.2.13 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

3.2.14 Unlatch and remove the lid from the lead pig containing the sample.

3.2.15 Using two tongs approximately 10 inches long, remove the parafilm and paper backing from the top of the 3½-ml vial. Ensure that the vial is not pulled out of the lead pig by the parafilm.

3.2.16 Ensure that the sample vial remains within the shielded portion of the lead pig for the maximum possible time.

3.2.17 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

3.2.18 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

3.3 Preparing for sample analysis

3.3.1 Ensure that the modified lead brick containing three vials is on cart #1 with their vial lids removed.

3.3.2 Ensure that no other contributing dose rate source is on cart #1.

3.3.3 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

3.3.3.1 For Boron Analysis, go to section 3.4.

3.3.3.2 For Chloride Analysis, go to section 3.5.

3.3.3.3 For Gamma Isotopic Analysis, go to section 3.6.

3.3.3.4 For Oxygen Analysis, go to section 3.7.

3.3.4 Using a pipette, withdraw an appropriate volume of liquid for each analysis required from the sample vial contained in the lead pig.

3.4 Boron analysis

3.4.1 For Boron analysis, proceed to 74CH-9ZZ06, Boron Autotitrator Operation and Calibration, using an RP Technician to provide radiological controls and support coverage. Return to this step when completed.

3.4.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.5 Chloride analysis

3.5.1 For Chloride analysis, proceed to 74CH-9ZZ72, Operation and Calibration of the Ion Chromatograph, using an RP Technician to provide radiological controls and support coverage. (Return to this step when completed.)

3.5.2 Proceed to section 6.0 of this document, sample analysis follow-up.

3.6 Gamma isotopic analysis

3.6.1 Dispense each volume of sample into one of the 7-ml vials contained in the modified 3-stage lead brick. Identify each vial if more than one is to be used.

3.6.2 Move cart #2 to an area away from cart #1 to minimize the dose rate. Relocate cart #2 to an area which will not affect Count Room operations.

3.6.3 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

3.6.4 Using the following equation, calculate activity (A):

$$A = (RV/G) \times 1000$$

where:

A = total sample activity in mCi (milliCuries)

R = sample dose rate reading at the top of the vial in R/hr (obtained by RP Technician in the preceding step)

V = sample volume in ml (normally 0.1 ml)

G = applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0 of this document, Sample Data Reference

1000 = conversion factor from Ci to mCi

Calculated activity: ______________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

3.6.5 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

3.6.6 After using pipettes to transfer the desired sample volume from one vial to another, use a 10-ml (B-D) syringe with a 1½-inch needle to dilute the sample to a total volume of 7 ml with D.I. water.

3.6.7 When the final dilution is complete, replace the screw cap on the vial to be counted and wrap the vial with parafilm, plastic wrap, or a plastic bag.

3.6.8 Prepare and attach clear identification information to the sample vial.

3.6.9 If dilutions were completed for the remaining dilution vials, cap them and attach clear identification information to them.

3.6.10 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

3.6.11 (The RP Technician will) record the dose rate reading(s) on a survey map and post / label the sample accordingly. ,

3.6.12 (The Chemistry Technician should) review the planned movement and use of the sample to allow the RP Technician to prepare the necessary area postings and contamination controls.

3.6.13 Place the 7-ml sample vial to be counted into a 1-inch lead carrying case and carry the sample to the sample counting room.

3.6.14 (The RP Technician will) post the Count Room area and prepare contamination controls as sample activity warrants.

3.6.15 (The Chemistry Technician should) review planned activities / work.

3.6.16 Using two 1-inch attenuator blocks for liquid isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per the PASS Liquid Sample Dilution Requirements in Section 9 of this document, Sample Data Reference.

3.6.17 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

3.6.18 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

3.6.19 Proceed to section 6.0, sample analysis follow-up.

3.7 Oxygen analysis

NOTE

Dissolved Oxygen for post-accident conditions will be determined by calculating the amount of Oxygen introduced into the system from either the borated water source (RWT) or the Containment atmosphere. Any Oxygen depletion due to Hydrogen scavenging or other means will be ignored. Henry's Law Constants were taken from EPRI, PWR Primary Water Chemistry Guidelines,. Revision 2, and Lange's Handbook of Chemistry, 12th Edition. Oxygen (cc/kg) is converted to Oxygen (ppm) in the ratio: ppm (0.7) = cc/kg.

3.7.1 For Small Break LOCA (pre-RAS), perform the following:

Determine RCS Oxygen concentration (Cf) using the following equation:

$$Cf = \left[\frac{\left[\frac{(Prwt) \times 0.209 \times 1.43}{H}\right] \times [Vrwt] \times CI \times VI}{Vf}\right]$$

where:

Cf = Final RCS oxygen concentration, ppm

Prwt = RWT pressure, psia

0.209 = Conversion factor for partial pressure of oxygen exerted on RWT (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

Vrwt = Volume of RWT added to system, gallons

CI = Initial concentration of RCS Oxygen, ppm

VI = Initial volume of RCS, gallons (maximum RCS volume = 100,000 gallons)

Vf = Final combined volume, gallons (maximum RCS volume = 100,000 gallons)

H = Henry's Law Constant, kg-psia/cc (from table below)

RWT Temperature (ºF)	kg-psia / cc
Trwt = 75	0.51
Trwt = 100	0.62
Trwt = 150	0.78
Trwt = 200	0.86

3.7.2 For Large Break LOCA (RAS), perform the following:

Determine RCS Oxygen concentration using the following equation:

$$\mathrm{Crcs} = \left[\frac{\mathrm{Pctmt} \times 0.209 \times 1.43}{\mathrm{H}}\right].$$

where:

Crcs = Concentration of Oxygen in RCS (ppm)

Pctmt = Containment pressure, psia

0.209 = Conversion factor for partial pressure of Oxygen in Containment (Oxygen is 20.9% of atmosphere)

1.43 = Conversion factor, ppm / (cc/kg)

H = Henry's Law Constant, kg-psia/cc (from table below)

RCS Temperature (ºF)	kg-psia / cc
T_{RCS} = 75	0.51
T_{RCS} = 100	0.62
T_{RCS} = 150	0.78
T_{RCS} = 200	0.86

4.0 PASS pressurized liquid (gas) / containment air sampling

4.1 Preparing for Sample Collection

4.1.1 Place the temporary syringe disposal shield inside the sample room.

4.1.2 (The Chemistry Technician shall) begin sampling operations from the sample location per 74OP-xSS02, Operation of the Post Accident Sampling System, by placing the system into sample recirculation mode.

4.1.3 (The Chemistry Technician will) inform the RP Technician, the RM Tech-nician, and the OSC Coordinator that PASS is in sample recirculation.

4.1.4 (The Chemistry Technician will) inform the RP Technician when the PASS sample is isolated and piping flush begins per 74OP-xSS02, Operation of the Post Accident Sampling System.

4.1.5 (The Chemistry Technician will) inform the RP Technician when flush is complete.

4.1.6 (The RP Technician will) survey the sample area, concentrating on the following areas:

4.1.6.1 Special concern should be placed on streaming from the septum ports located at the front of the sample sink approximately 6 inches from the floor and at the left side of the sample sink approximately 18 inches from the floor.

4.1.6.2 Ask the Chemistry Technician which septum port is appropriate for the intended sample prior to entering the sample room

4.1.6.3 Changing or unexpected conditions and dose rates which differ from the planned activities as discussed in the Sampling Team Briefing must be brought to the attention of the OSC Coordinator prior to continuing

4.1.6.4 Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), may be used as a job aid as required to log information collected per this document

NOTE

Depending on the analyses to be performed, it may be necessary to withdraw up to 2 samples.

Analysis to be Done	Volume Needed
H2 / O2	0.5 cc
Gamma Isotopic	0.1 cc

4.1.7 (The Chemistry Technician shall) inform the RP Technician of the number and volume of samples required.

4.1.8 (The Chemistry and RP Technicians shall) review the dose rates, planned sample volume, and other activities to ensure conditions and expected exposures remain within the scope of the Briefing Guidelines. Ensure that the Chemistry Technician's estimated time of exposure to the unshielded sample is a conservative assumption. Once the sample is obtained, it must be placed into the shielded holder - the sample cannot be injected back into the system.

4.1.9 (The RP Technician should) inform the OSC Coordinator that sample collection is about to begin.

4.1.10 (The Chemistry Technician should) inform the Chemistry Coordinator that sample collection is about to begin.

4.1.11 (The RP Technician shall) examine the placement of the Chemistry Technician's dosimetry to ensure adequate and accurate monitoring capabilities exist.

4.2 Collecting the sample

CAUTION

A 0.5 cc syringe of RCS gas, collected 3 hours after a LOCA with a 100% fuel failure, is estimated to read approximately 330 REM / minute contact, and will decrease to 27 REM / minute at 6 cm (2.4 inches). The following steps (Collecting the Sample) allow the highest exposure potential, though they take place within a very short time span. All actions by Chemistry and Radiation Protection should be "dry run" immediately prior to obtaining the actual sample. During the "dry run", special attention should be directed to safe and stable positioning of the carts and pigs, avoidance of septum area shine, etc.

4.2.1 With the equipment previously staged on Chemistry Carts #1 and #2, position the lead pig and cart #2 near the sample area to allow a safe and rapid transfer from septum port area to pig.

4.2.2 Insert the gas-tight syringe into the handling tool and adjust the tool to withdraw the desired amount.

4.2.3 Using the syringe handling tool, place the syringe into the port guide tube assembly and withdraw the desired sample volume into the syringe.

4.2.4 (The Chemistry Technician will) place the syringe handling tool containing the syringe on the sample cart and then retreat to a designated low dose area.

4.2.5 (The RP Technician shall) take the dose rate reading on the syringe to establish initial working conditions.

4.2.6 If the sample is to be transferred to an Unaffected Unit, (the Chemistry Technician will) lock the syringe using the remote syringe locking tool.

4.2.7 (The Chemistry Technician will) place the syringe handling tool containing the syringe in the syringe carrying case.

4.2.8 If the sample is to be transferred to an Unaffected Unit for analysis, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

4.2.9 Relocate the sample cart with the sample to an area of known background readings for the required analysis. Ensure that the area selected will not affect Count Room operations due to an unshielded source.

4.2.10 (The Chemistry Technician and the RP Technician shall) review the dose rates and required sample analysis time.

4.2.11 Ensure that the sample remains shielded for the maximum possible time.

4.2.12 (The Chemistry Technician will) review use of the contamination controls prior to proceeding.

4.2.13 (The RP Technician shall) directly monitor all work in the immediate area and ensure localized posting and contamination controls are in effect.

4.3 Preparing for sample analysis

4.3.1 Ensure that all analyses activities are performed in accordance with Chemistry procedures and that the RP Technician is available to provide radiological controls and coverage.

4.3.2 Determine the appropriate required analysis to perform and proceed to the appropriate analysis block per the following:

4.3.2.1 For Hydrogen and Oxygen Analyses, go to section 4.4.

4.3.2.2 For Gamma Isotopic Analysis, go to section 4.5.

4.4 Hydrogen and Oxygen analyses

4.4.1 For Hydrogen and Oxygen analyses, transport 0.5 cc of sample to the gas chromatograph and analyze the sample in accordance with 74CH-9XC40, Operation and Calibration of the Hewlett Packard Gas Chromatograph. Return to this step when completed.

4.4.2 Proceed to section 6.0, sample analysis follow-up.

4.5 Gamma Isotopic analysis

4.5.1 For Gamma Isotopic analysis, transport 0.1 cc of sample to the sample preparation area and dispense the sample volume into a 9.2 cc gas vial (the vial previously evacuated 0.1 cc) contained in the modified lead bricks. The sample is now shielded.

4.5.2 Dispose of the syringe into the syringe disposal cask, needle down.

4.5.3 Move cart #2 to an area away from cart #1 to minimize the working dose.

4.5.4 Prior to any dilution performed on the vial previously prepared for Gamma Isotopic analysis, the RP Technician shall follow the direction of the Chemistry Technician and use a teletector to obtain the dose reading at the top of the vial.

4.5.5 Using the following equation, calculate activity (A):

$$A = (RV / G) \times 1000$$

where:

A = Total sample activity in mCi (milliCuries)

R = Sample dose rate reading at the top of the vial in REM/hr (obtained by RP Technician in the preceding step)

V = Sample volume in ml (normally 0.1 ml)

G = Applicable conversion factor for the sample being analyzed (REM/hour/Ci/ml) from (Dose Rate - Curie Conversion Factors) in section 9.0, Sample Data Reference

1000 = Conversion factor from Ci to mCi

Calculated activity: ______________________ mCi

NOTE

Isotopic analysis should not be performed on any PASS liquid sample with activity greater than 1.4 mCi or readings greater than 800 mrem / hour. Consequently, the following direction provides the methodology to determine if dilution is required and, if so, the amount of dilution. The initial dilution does not affect the total activity in the first vial.

4.5.6 Use Factor A (total sample activity in mCi) to determine the required dilution to obtain a sample activity of less than or equal to 1.4 mCi utilizing the calculated data (PASS Liquid Sample Dilution Requirements) in section 9.0 of this document, Sample Data Reference.

4.5.7 Perform the appropriate dilution by evacuating the specified amount from a clean 9.2 cc gas vial and injecting the sample.

4.5.8 (The RP Technician will) obtain a contact and a 1-foot dose rate reading on the sample.

4.5.9 (The RP Technician will) record the dose rate reading(s) and post / label the sample accordingly.

4.5.10 Place the final sample into a 1-inch shield and transport the sample to the sample counting room.

4.5.11 Using two 1-inch attenuator blocks for gas isotopic sample analysis initially, carefully and quickly remove the sample vial from the lead carrying case and orient the sample to the proper position for counting.

NOTE

The sample volume input for the Multi-Channel Analyzer Command Procedure is 1 / DF, where DF = Dilution Factor determined per section 9.0 of this document, Sample Data Reference.

4.5.12 Perform analysis of the sample in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System.

4.5.13 Carefully remove the sample from the lead counting shield and place the sample in the lead carrying case.

4.5.14 Proceed to section 6.0 in this document, Sample Analysis Follow-up.

5.0 RU-144 / RU-146 High Range sampling

5.1 Preparing resources

5.1.1 "Mn" is the designator used for a Bechtel RU monitor number (e.g., Monitor-30 correlates to RU-144, Monitor-49 correlates to RU-146). "C" is the designator for the Channel Number or sample chamber, as appropriate.

5.1.2 RU-144 / RU-146 have two particulate / Iodine continuous (default) collection chambers and a third grab sample chamber, which has precisely timed collection capabilities. These are identified as 1, 2, and 3 from left to right when facing the chamber collection trays. The timed grab sample chamber is #3.

5.1.3 2 sample choices exist:

5.1.3.1 Either one of the two continuous channels may be collected after placing the alternate channel into operation, or...

5.1.3.2 A timed grab sample may be taken (low volume) in conditions of high Iodine activity

5.1.4 The instructions in this Section should be performed by the Radiological Monitoring Technician and pertain only to RU-144 and RU-146 particulate and Iodine samples. All other samples should be obtained in accordance with 74RM-9EF60, RMS Sample Collection.

5.1.5 Access to either monitor requires established radio communications with Technical Support Center personnel or with those designated per the team briefing. The RP Technician shall ensure that radio communications are maintained.

CAUTION

Exposure rates may be extremely high when attempting to obtain samples from an effluent monitor under accident conditions - both at the skid and enroute. All ingress / egress paths should be evaluated to minimize potential dose. The instructions herein may be performed out-of-sequence for ALARA considerations. Sample dose rates will be dependent on sample flow rates and Iodine activity levels. Form EP-0055, RMS Skid Collection Time Calculation (see Appendix C - Forms), may be used to determine the collection time in high Iodine activity situations to maintain sample dose rates below the 0.25 Ci sample counting limit.

5.1.6 (The RP Technician shall) ensure that the Radiological Protection Coordinator (RPC) in the Technical Support Center (TSC), or designee, will monitor plant and RMS conditions and provide them to the sampling team via radio, as appropriate.

5.1.7 Use Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as required, to log information accumulated during performance of these instructions.

NOTE

The filter head, a stainless steel head specifically designed for the RMS, and the required sample handling tools / tongs, are located in the OSC Emergency Kit.

5.1.8 Prepare all equipment associated with Chemistry Cart #3 for RMS high range skid sampling. Form EP-0053, Chemistry Cart #3 Preparation Checklist (see Appendix C - Forms), may be used as a guide.

5.1.9 If RU-146 sampling is to be performed, ensure that a bucket with at least 50' of rope is included with the equipment.

5.1.10 Load the filter head with a Silver Zeolite (AgX) Cartridge and particulate filter.

5.1.11 Determine the sample to prepare and proceed to the appropriate sample preparation block per the following:

5.1.11.1 To prepare a continuous collection sample from RU-144, go to section 5.2.

5.1.11.2 To prepare a timed grab sample from RU-144, go to section 5.3.

5.1.11.3 To prepare a continuous collection sample from RU-146, go to section 5.4.

5.1.11.4 To prepare a timed grab sample from RU-146, go to section 5.5.

5.2 RU-144 Continuous Collection Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.2.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.2.2 Change the sample chamber by first placing the DCU into "Privileged" Mode and then typing DCC 30 3 (1 or 2) and pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 15 (1 or 2) ENT.)

5.2.3 Proceed to section 5.6.

5.3 RU-144 Timed Grab Sample Preparation

NOTE

Sample collection dose can be minimized by using the DCU if communications exist with the RU-144 monitor. If communications are lost, operations may be performed using a KEPIC at the PAMU or locally at the KESMIC, depending on area dose rate conditions. However, data entered at the KEPIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer. If communications are reestablished with the minicomputer, the data will default to the last configuration value entered at the DCU.

5.3.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 4 23 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.3.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.3.3 Set the grab sample duration by first typing GSD 30 3 (sample duration in seconds) and then pressing <RETURN>. [Example: 90 seconds is entered as "9.00 01 ENT"] (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter SET 3 16 (sample duration in seconds) ENT. Verify by typing DSP 3 16 ENT.)

5.3.4 Initiate the grab sample by first typing IGS 30 3 and then pressing <ENTER>. (At alternate locations, first place the keyswitch in "ENABLE/LOCAL" and then enter FTN 3 02 ENT.)

5.3.5 Allow sample collection to complete before continuing. The RP Technician can use this time period to establish a Cold Area for the team.

5.3.6 Proceed to section 5.6.

5.4 RU-146 Continuous Collection Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.4.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. (At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.)

5.4.2 Change the sample chamber by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 15 (1 or 2) ENT.

5.4.3 Proceed to section 5.6.

5.5 RU-146 Timed Grab Sample Preparation

NOTE

Only current sample collection data can be obtained at the DCU. All other actions must be performed at the KERIC, KELIC, or the KESMIC, depending on area dose rate conditions. However, data entered at the KELIC or KESMIC will only remain valid while the monitor is not communicating with the minicomputer or the KERIC. If communications are re-established with the minicomputer, the data will default to the last configuration value entered at the KERIC.

5.5.1 Obtain the duration (seconds) of sample collection and sample flow (cfm) for the current sample at the DCU by first typing Mn 3 and then pressing the <DATABASE> key. At alternate locations, enter DSP 3 16 ENT to obtain collection duration; enter DSP 1 19 ENT to obtain sample flow.

5.5.2 Maintain records as required. When the Timed Grab Sample is completed, the flow will return to the channel entered.

CAUTION

Verify that the grab sample duration is entered correctly. A collection cannot be stopped once it has been started until the entered duration time has elapsed.

5.5.3 Set the grab sample duration by first placing the keyswitch in "ENABLE/LOCAL" and then entering SET 3 16 (sample duration in seconds) ENT. [Example: 90 seconds is entered as "9.00 01 ENT"]. Verify by typing DSP 3 16 ENT.

5.5.4 Initiate the grab sample by first placing the keyswitch in "ENABLE/LOCAL" and then entering FTN 3 02 ENT.

5.5.5 Allow sample collection to complete before continuing. (The RP Tech-nician can use this time period to establish a Cold Area for the team.)

5.5.6 Proceed to section 5.6.

5.6 High Range Collection

NOTE

RMS skid sampling may require passage through and/or working in general areas accompanied by high and varying dose rates. Constant attention must be given to background dose rates and expected high dose rates from the sample media. The travel route employed and sampling activities performed by Chemistry and RP should be acted and talked through prior to the actual sampling evolution.

5.6.1 With the necessary equipment, proceed to the monitor location.

5.6.2 Taking along that which is required, proceed to the monitor. If on location at RU-146, leave the lead pig with the lid open on the 140' elevation directly below the point from which the sample will be lowered. Carry the latch handle, handling tool, bucket, rope, and new filter head up the stairs to the monitor.

5.6.3 (The RP Technician shall) verify working dose rates at the monitor.

5.6.4 Ensure that the transfer pig lid is open and that the transfer pig is positioned for smooth and quick transfer of the sample. If on location at RU-146, tie one end of the rope to the bucket handle and the other end to the railing. Ensure that samples can be lowered without impairment.

5.6.5 Prior to isolating the sample flow valves, check the position of the solenoid valves to ensure that the channel has been isolated. The lamp above the active collection channel will be illuminated.

5.6.6 Close the inlet and outlet sample flow valves of the particulate / Iodine channel(s) as directed in the team briefing per the following chart:

P/I Chamber #1		P/I Chamber #2		P/I Chamber #3	
IN	OUT	IN	OUT	IN	OUT
HCV-02	HCV-05	HCV-03	HCV-06	HCV-04	HCV-07

5.6.7 Open the shielded door by raising the latch.

5.6.8 (The RP Technician should) measure the dose rate on the P/I holder. If the dose rate exceeds the contact reading [REM / hr] as specified in the team briefing, the shield door should be closed and the sample left to decay prior to removal.

5.6.9 Insert the latch handle tool over the sample assembly lever and turn it counter-clockwise to release the spring tension. (This step can be performed manually as dose rates permit.)

5.6.10 Remove the Iodine and particulate sample filter head from the assembly quickly and carefully using tongs or manually as dose rates permit.

5.6.11 (The RP Technician should) obtain 1-foot dose rate readings on the sample filter head.

5.6.12 Place the sample filter head in the lead transfer pig and replace the lid. If on location at RU-146, place the sample filter head in the bucket and lower it to the 140' elevation at the pig.

5.6.13 Place the new filter head in the monitor sample assembly.

5.6.14 Turn the lever on the sample assembly clockwise using the latch handle or manually as dose rates permit.

5.6.15 Close and latch the shielded door and open the appropriate inlet and outlet valves previously closed.

5.6.16 Obtain total flow values.

5.6.17 If necessary, use the RMS key to place the microprocessor in "Local" or "Enable" Mode.

5.6.18 At the microprocessor, enter DSP C 37 ENT to display total flow in cubic feet, where "C" refers to 3 for continuous grab sample chamber #1, 4 for continuous grab sample chamber #2, or 5 for the timed grab sample chamber.

5.6.19 Record this value on Form EP-0054, Accident Sample Worksheet (see Appendix C - Forms), as appropriate.

5.6.20 Step the filter and zero the flow totalizer and timer by performing the following actions:

5.6.20.1 Enter STP C ENT to step the filter. Use the number previously entered as "C."

5.6.20.2 Verify that the totalizer has been re-zeroed by entering DSP C 37 ENT. Use the number previously entered as "C."

5.6.21 Return the microprocessor to "Remote" or "Disable" Mode.

5.6.22 Press the "TEST-LT CK" Button to ensure that microprocessor communications are restored.

5.6.23 (If on location at RU-146, return to the 140' elevation and place the sample filter head in the transfer pig and replace the lid.)

5.6.24 (The RP Technician will) contact the OSC Coordinator and (the Radiological Monitoring Technician will) contact the Chemistry Coordinator and relay that the filters have been changed.

5.6.25 Deliver the sample to the appropriate Counting Room.

5.6.26 (The RP Technician will) label and shield (or store), as designated, the sample to minimize background activity.

5.6.27 (The Radiological Monitoring Technician will) ensure that all necessary data is attached.

5.6.28 If the sample is to be transferred to an Unaffected Unit for counting, proceed to section 8.0, Sample Transportation. Otherwise, continue in this Section.

5.7 High Range Skid Sample Analysis

CAUTION

Contact dose rate readings on the particulate and Iodine assembly may be greater than 9.0 REM / hour. Maintain adequate distances, minimize time periods in proximity, and maximize the use of shielding to ensure that personnel doses during sample analyses are maintained ALARA.

5.7.1 Using the P/I radiation level at a distance of 1 foot from the P/I cartridge, (readings obtained previously or at this time with the pig lid removed), determine the best method to obtain an estimate of isotopic Iodine levels.

NOTE

Counting systems in the laboratory are restricted to approximately 0.25 Ci in the sample due to avalanche and Compton scatter of the sample.

5.7.2 If dose rates are > 0.8 REM / hour, perform the following actions:

5.7.2.1 Using section 9.0, Sample Data Reference, RMS P/I Dose Rate - Curie Conversion Factors, obtain the appropriate net dose rate Curie conversion factors for I131 through I135, according to the time elapsed from the time of the accident to the time of the sample.

5.7.2.2 Calculate the estimated Curie content using the following formula:

AI = R X G

where:

AI = Individual isotopic activity in Curies

R = Unshielded sample dose rate reading at 1 foot in REM / hour

G = Individual isotopic conversion factor for I131 through I135 from RMS P/I Dose Rate - Curie Conversion Factors in section 9.0, Sample Data Reference

5.7.2.3 Calculate the effluent Iodine concentrations using the following formula:

$$\mathrm{Ci} = \frac{35.3 \times \mathrm{Ai}}{\mathrm{V} \times 0.04}$$

where:

Ci = Iodine concentration of isotope "I," µCi/cc

V = Sample volume, cubic feet

35.3 = Conversion factor, µCi - ft3 / Ci - cc

0.04 = Plate-out correction factor for RU-144 / RU-146 skid samples

5.7.2.4 Calculate the total Iodine concentration by summing the isotopic concentrations.

5.7.2.5 Proceed to section 6.0, Sample Analysis Follow-up.

5.7.3 If dose rates are less than or equal to 0.8 REM / hour, perform the following actions:

5.7.3.1 Using six 1-inch attenuator blocks initially, carefully and quickly place the sample filter head assembly in the lead shield in the sample holder rack at the highest elevation centered directly over the appropriate attenuator block. Remove blocks as necessary.

5.7.3.2 Perform sample analysis in accordance with 74CH-9XC50, Operation and Calibration of the Gamma Spectrometry System. Multiply the sample volume by 0.04 Iodine plate-out correction factor.

5.7.3.3 Remove the sample from the lead shield quickly and carefully using tongs and place the sample in a lead cask / pig.

5.7.3.4 Proceed to section 6.0, Sample Analysis Follow-up.

6.0 Sample analysis follow-up

6.1 Control of Analyzed Samples

NOTE

Form EP-0514, Containment Radiochemistry CDA (Parts 1-11 - see Appendix C - Forms) can be used to facilitate transmittal of data to the Technical Support Center.

6.2 Report analytical results to the Chemistry Coordinator upon completion of sample analysis.

NOTE

As appropriate, it is recommended that the Boron sample be discarded to the Chemical Drain Tank to minimize handling of diluted and contaminated samples.

6.3 (The Chemistry Coordinator will) designate which samples are to be saved and which are to be discarded.

6.4 Analyzed samples designated to be saved shall be dose rated, labeled, and shielded (or stored) as specified by the RP Technician to minimize background activity.

7.0 **Preplanned Alternate Sampling**

CAUTION

Significant exposure potential exists for the steps in this Section if performed under fuel failure conditions. The PASS should be used in all such conditions, if available. Team briefing and preparation must be planned with additional detail under fuel failure conditions in accordance with the guidance in this Section.

The loss of the PASS unit will remove the built-in sample and recirculation path shielding provided by that system and the built-in control of airborne (gas) leakage.

Section 9.0, Sample Data Reference, PASS Dose Information / Thumb Rules, applies to use of the PASS unit only. Use of the alternate sampling path under failed fuel conditions implies operating under worst-case conditions. It is imperative that actions are based on those conditions rather than assumptions because of the potential for lethal dose areas to exist.

Dose rates in the primary sample sink area will mandate stay time controls for worst-case situations. It will be crucial to involve the RM Technician to provide full-time monitoring of RMS indications (dose rates and airborne levels) to assist the PASS team.

Airborne problems are minimized using PASS, but have the potential to be extreme when using the Preplanned Alternate Sampling methodology. Breathing protection (SCBA or supplied air) should, therefore, be used if practicable.

Analysis in the Affected Unit is highly doubtful when using the Preplanned Alternate Sampling methodology. Another Unaffected Unit laboratory should be prepared for sample analysis.

7.1 Review both Section 3.6 (specific information applicable to preplanned alternate sampling conditions and assumptions) and Appendices A and B of 74DP-9CY02, Post Accident Sampling Program.

7.2 Review Section 3 of 74OP-9SS05, Preplanned Alternate Sampling.

7.3 Clarify the planned sequence of actions with the sampling team and how these actions integrate with this procedure -- an example follows:

PASS is inoperable and an RCS liquid sample must be collected from the primary sample sink. The team would use part of Section 4 of 74OP-9SS05, Preplanned Alternate Sampling, to obtain a sample. They would then implement this procedure and perform Section 3.3, PASS Depressurized Liquid Sampling - Sample Analysis. (All actions should be acted and talked through during the briefing to ensure that a workable sequence of actions has been thoroughly formulated.)

7.4 Ensure all applicable actions relative to Appendix K - Emergency Exposures and KI have been addressed for the sample team.

7.5 Review the plant conditions with the sample team and the potential for fuel failure and its impacts.

7.6 Obtain the sample and analyze accordingly per the guidance disseminated in the team briefing.

8.0 Sample transportation

NOTE

Using the lead pig transfer rod, two individuals will be required to transport the lead pig containing the sample to an Unaffected Unit. The transfer rod should allow a 3-foot distance between each individual and the lead pig.

8.1 Onsite sample movement

8.1.1 (The RP Technician will) ensure that the sample is radiologically labeled and packaged, as appropriate, prior to transfer.

8.1.2 (The Chemistry Technician and Chemistry Coordinator will) determine the location to which the sample will be transferred.

8.1.3 (The Radiological Protection Coordinator and the RP Technician shall) determine the route based on current site conditions.

8.1.4 An Emergency REP and a team briefing shall be prepared, with all participating group personnel signed onto the REP prior to start of sample movement.

8.1.5 Advise the Security Director of the planned route of passage for Security escort and for the clearing of passageways in the receiving Unit, if appropriate.

8.1.6 Obtain an appropriate vehicle for transportation between Units as the activity and plant conditions warrant.

8.1.7 Prior to transfer, transmit copies of all applicable RP survey data and Chemistry information for the sample to the receiving Unit's RP and Chemistry Departments.

8.1.8 Prior to transfer, obtain acknowledgement of sample receipt preparations from the appropriate receiving Unit's department personnel.

8.1.9 Transfer the sample using planned resources, as necessary.

8.1.10 (Receiving Unit personnel will) assume continuation of performance in this procedure upon receipt of the transferred sample.

8.2 Offsite sample shipping

8.2.1 Labeling and shipping of samples will be performed by site personnel who are trained and qualified on applicable procedures in accordance with current site radwaste shipping and handling requirements.

9.0 Sample data reference

9.1 This information is based on PVNGS Calculation 03-NC-SS-A01, PASS Doses. The calculation is for a LOCA worst-case analysis and is based on the following assumptions:

9.1.1 Sampling is performed in the Affected Unit using the PASS.

9.1.2 Analysis is performed in an Unaffected Unit.

9.1.3 Dose traveling to and from the Affected Unit is not included (~2 REM TEDE).

9.1.4 Use is made of remote handling tools.

9.1.5 Source term data is from Bechtel Calculation 13-NC-CH-304, Post LOCA Sample Doses.

9.1.6 Airborne dose rates from Bechtel Calculation 13-NC-ZA-322, Post LOCA Airborne Dose for PASS, are negligible.

9.1.7 Dose given is for normal ventilation operable and for loss of power conditions (i.e., loss of ventilation).

9.1.8 Extremity dose "EX" is SDE to the extremities.

Dose in REM	RCS Liquid	RCS Gas	CTMT Air	RCS Liquid w/ LOP	RCS Gas w/ LOP	CTMT Air w/ LOP
Preparation	0.36 DDE	0.37 DDE	0.37 DDE	1.32 DDE	1.75 DDE	1.53 DDE
Sampling	0.12 DDE	0.10 DDE	0.09 DDE	0.80 DDE	0.66 DDE	0.47 DDE
Dilutions	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX	2.20E-03 DDE 0.26 EX	1.30E-04 DDE 1.30E-04 EX	3.50E-06 DDE 8.70E-06 EX
Analysis	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX	4.20E-02 DDE 0.22 EX	1.70E-03 DDE 2.90E-03 EX	4.70E-05 DDE 7.30E-05 EX
TOTALS	0.53 DDE	0.47 DDE	0.46 DDE	2.20 DDE	2.40 DDE	2.00 DDE

Sample Type	Sample Quantity (cc or ml)	mrem / Hour @ 18"
RCS Liquid	0.1	425
	0.3	1270
	0.8	3400
RCS Gas	0.1	68
	0.5	340
Containment Atmosphere	0.1	2
	0.5	9

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)

RCS LIQUID SUMMARY

Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
0	450	1.5720	286.9
1	290	1.1723	248.9
4	150	0.8106	188.0
8	105	0.6441	163.4
12	84	0.5481	151.6
24	52	0.3912	132.8
48	30	0.2626	115.9
72	22	0.2051	107.4
168	12	0.1232	96.8
252	8.9	0.0923	95.9

RCS GAS SUMMARY			
0	430	1.4696	295.3
1	280	1.0949	256.2
4	140	0.7438	192.2
8	96	0.5799	166.0
12	74	0.4855	153.3
24	44	0.3329	132.3
48	24	0.2105	112.5
72	16	0.1577	102.0
168	7.8	0.0869	89.2
252	5.4	0.0611	88.4

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

DOSE RATE - CURIE CONVERSION FACTORS (extrapolate as necessary)			
CONTAINMENT ATMOSPHERE SUMMARY			
Time *(Hours)*	REM / Hour @ 6 cm **	Ci / ml or Ci / cc	Conversion Factor G * *(REM / Hour / Ci / cc)*
0	4.30	0.0170	249.770
1	1.20	0.0074	163.230
4	0.45	0.0050	89.670
8	0.25	0.0041	59.654
12	0.18	0.0037	47.760
24	0.11	0.0031	36.496
48	0.08	0.0025	31.960
72	0.07	0.0022	30.775
168	0.04	0.0012	30.240
252	0.02	0.0008	30.603
SI SUMMARY			
0	110	0.3657	290.970
1	69	0.2732	252.510
4	36	0.1874	190.200
8	24	0.1476	164.960
12	19	0.1247	152.720
24	12	0.0874	133.010
48	6.6	0.0571	114.920
72	4.6	0.0438	105.670
168	2.4	0.0254	94.245
252	1.7	0.0186	93.381

* Conversion factor is variable "G"

** 6 cm is equivalent to the reading at the top of the vial

PASS LIQUID SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)

<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	70	0.1	14.29	4900	0.5	1.02	68600
0.1	900	70	0.1	12.66	4900	0.5	0.92	68600
0.1	800	70	0.1	11.43	4900	0.5	0.82	68600
0.1	700	70	0.1	10.00	4900	0.5	0.71	68600
0.1	600	70	0.1	8.57	4900	1.0	1.22	34300
0.1	500	70	0.1	7.14	4900	1.0	1.02	34300
0.1	400	70	0.1	5.51	4900	1.0	0.82	34300
0.1	300	70	0.1	4.29	4900	1.0	0.61	34300
0.1	200	70	0.1	2.86	4900	2.0	0.82	17150
0.1	100	70	0.1	1.43	4900	2.0	0.41	17150
0.1	90	70	0.1	1.29	4900			
0.1	80	70	0.1	1.14	4900			
0.1	70	70	0.1	1.00	4900			
0.1	60	70	0.1	0.86	4900			
0.1	50	70	0.1	0.71	4900			
0.1	40	70	0.2	1.14	2450			
0.1	30	70	0.2	0.86	2450			
0.1	20	70	0.3	0.86	1633			
0.1	10	70	0.5	0.71	980			
0.1	9	70	0.5	0.64	980			
0.1	8	70	0.5	0.57	980			
0.1	7	70	0.5	0.50	980			
0.1	6	70	0.5	0.43	980			
0.1	5	70	0.5	0.36	980			
0.1	4	70	0.5	0.28	980			
0.1	3	70	0.5	0.22	980			
0.1	2	70	0.5	0.14	980			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 7 ml and C2 = 1.4 mCi

PASS GAS SAMPLE DILUTION REQUIREMENTS (extrapolate as necessary)								
<<<<< VIAL #1 >>>>>			<<<<< VIAL #2 >>>>>			<<<<< VIAL #3 >>>>>		
Sample from PASS (ml)	Final mCi "A"	D.F.	Sampleml Vial #1	Final mCi	Final D.F.	Sampleml Vial #2	Final mCi	Final D.F.
0.1	1000	92	0.1	10.87	8464	0.5	0.59	155738
0.1	900	92	0.1	9.78	8464	0.5	0.53	155738
0.1	800	92	0.1	8.70	8464	0.5	0.47	155738
0.1	700	92	0.1	7.61	8464	0.5	0.41	155738
0.1	600	92	0.1	6.52	8464	1.0	0.71	77869
0.1	500	92	0.1	5.43	8464	1.0	0.59	77869
0.1	400	92	0.1	4.35	8464	1.0	0.47	77869
0.1	300	92	0.1	3.26	8464	1.0	0.35	77869
0.1	200	92	0.1	2.17	8464	2.0	0.47	38934
0.1	100	92	0.1	1.09	8464	2.0	0.24	38934
0.1	90	92	0.1	0.98	8464			
0.1	80	92	0.1	0.87	4232			
0.1	70	92	0.1	0.76	4232			
0.1	60	92	0.1	0.65	2821			
0.1	50	92	0.1	0.54	1693			
0.1	40	92	0.2	0.87	1693			
0.1	30	92	0.2	0.65	1693			
0.1	20	92	0.3	0.65	1693			
0.1	10	92	0.5	0.54	1693			
0.1	9	92	0.5	0.49	1693			
0.1	8	92	0.5	0.44	1693			
0.1	7	92	0.5	0.38	1693			
0.1	6	92	0.5	0.32	1693			
0.1	5	92	0.5	0.27	1693			
0.1	4	92	0.5	0.21	1691			
0.1	3	92	0.5	0.16	1693			
0.1	2	92	0.5	0.11	1693			

Alternative Calculation:

$$V1 = \frac{C2V2}{C1}$$

Where: C1 = value for "A" calculated per section 3.6, PASS Depressurized Liquid Sampling, Gamma Isotopic Analysis
V2 = 9.2cc and C2 = 1.4 mCi.

RMS P/I DOSE RATE - CURIE CONVERSION FACTORS					
Time After	I^{131} *("G")*	I^{132} *("G")*	I^{133} *("G")*	I^{134} *("G")*	I^{135} *("G")*
Accident *(hours)*	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr	Ci / REM / hr
0	1.20E-02	1.30E-02	2.60E-02	2.80E-02	2.40E-02
1	1.20E-02	9.30E-03	2.40E-02	1.30E-02	2.20E-02
2	9.40E-03	5.40E-03	1.80E-02	4.40E-03	1.50E-02
3	2.40E-02	1.00E-02	4.50E-02	5.10E-03	3.50E-02
4	2.90E-02	9.00E-03	5.30E-02	2.80E-03	3.80E-02
5	3.40E-02	7.80E-03	6.00E-02	1.50E-03	4.00E-02
6	3.80E-02	6.40E-03	6.50E-02	6.80E-04	4.10E-02
7	4.20E-02	5.30E-03	7.10E-02	3.80E-04	4.10E-02
8	4.60E-02	4.50E-03	7.50E-02	2.10E-05	4.00E-02
9	5.00E-02	3.60E-03	7.90E-02	9.00E-05	8.10E-03
10	5.40E-02	2.90E-03	8.30E-02	4.90E-05	3.90E-02
11	5.90E-02	2.10E-03	8.70E-02	2.10E-05	3.80E-02
12	6.20E-02	1.70E-03	8.90E-02	1.10E-06	3.60E-02
13	6.60E-02	1.20E-03	9.20E-02	5.40E-06	3.50E-02
14	7.00E-02	1.30E-03	9.50E-02	2.60E-06	3.30E-02
15	7.40E-02	6.80E-04	9.70E-02	1.40E-06	3.20E-02
16	7.90E-02	7.20E-04	1.00E-01	5.80E-07	3.00E-02
17	8.20E-02	5.30E-04	1.00E-01	3.00E-07	2.90E-02
18	8.60E-02	4.00E-04	1.00E-01	1.60E-07	2.70E-02
19	9.00E-02	3.40E-04	1.00E-01	6.70E-08	2.60E-02
20	9.40E-02	2.60E-04	1.10E-01	2.60E-08	2.50E-02
21	9.80E-02	1.80E-04	1.10E-01	1.80E-08	2.30E-02
22	1.00E-01	1.90E-04	1.10E-01	6.70E-09	2.10E-02
23	1.10E-01	1.00E-04	1.10E-01	3.00E-09	2.00E-02
24	1.10E-01	9.30E-05	1.10E-01	1.00E-09	1.90E-03
24 - 48	1.60E-01	3.10E-06	1.10E-01	1.60E-13	7.80E-03
48 - 72	2.40E-01	4.40E-09	8.20E-02	1.60E-21	1.10E-03
72 - 96	3.00E-01	4.30E-12	5.00E-02	1.30E-29	1.20E-04
96 - 120	3.40E-01	3.70E-15	2.60E-02	9.10E-38	1.20E-05

NOTE: P/I exposure rate is calculated assuming that the measurement is taken 1 foot from the P/I cartridge. These conversion factors are independent of the distance that the radiation measurement is taken.

Appendix M - Ultimate Heat Sink considerations

1.0 Ultimate Heat Sink considerations

For an alternate source of Spray Pond inventory, direct Maintenance and Engineering to implement actions necessary to restore Spray Pond inventory, with particular respect to the following items:

1.1 Ensure that these actions are initiated within 6 days following a seismic event/SSE that results in irreparable damage to the 3 onsite wells which supply makeup water to the spray pond.

1.2 Secure a dependable water supply capable of delivering 1200 gpm within 21 days of an SSE or other accident which eliminates or restricts normal water supply to an inadequate level.

1.3 Ensure that the Environmental Department files a Notice of Intent to Drill with the Arizona Department of Water Resources before new well drilling commences.

1.4 Ensure that, as soon as practical, the Environmental Department applies for a temporary permit to withdraw groundwater in excess of our grandfathered right by submitting evidence that an emergency exists to the Director of the Arizona Department of Water Resources.

1.5 Ensure that Spare Well Water Pump (MLIS ID #45750074) and 200 HP, 3-phase, 1800 rpm Electric Motor (MLIS ID #44670001) have been adequately maintained under PM Task 054390.

1.6 Ensure an accurate assessment of current water inventory, normal water supply system status, time estimates for restoration of normal systems, identification of alternate supplies, and technically sound solutions to any outstanding water supply problems.

1.7 Ensure that a well drilling company capable of constructing a well within 15 days is mobilized.

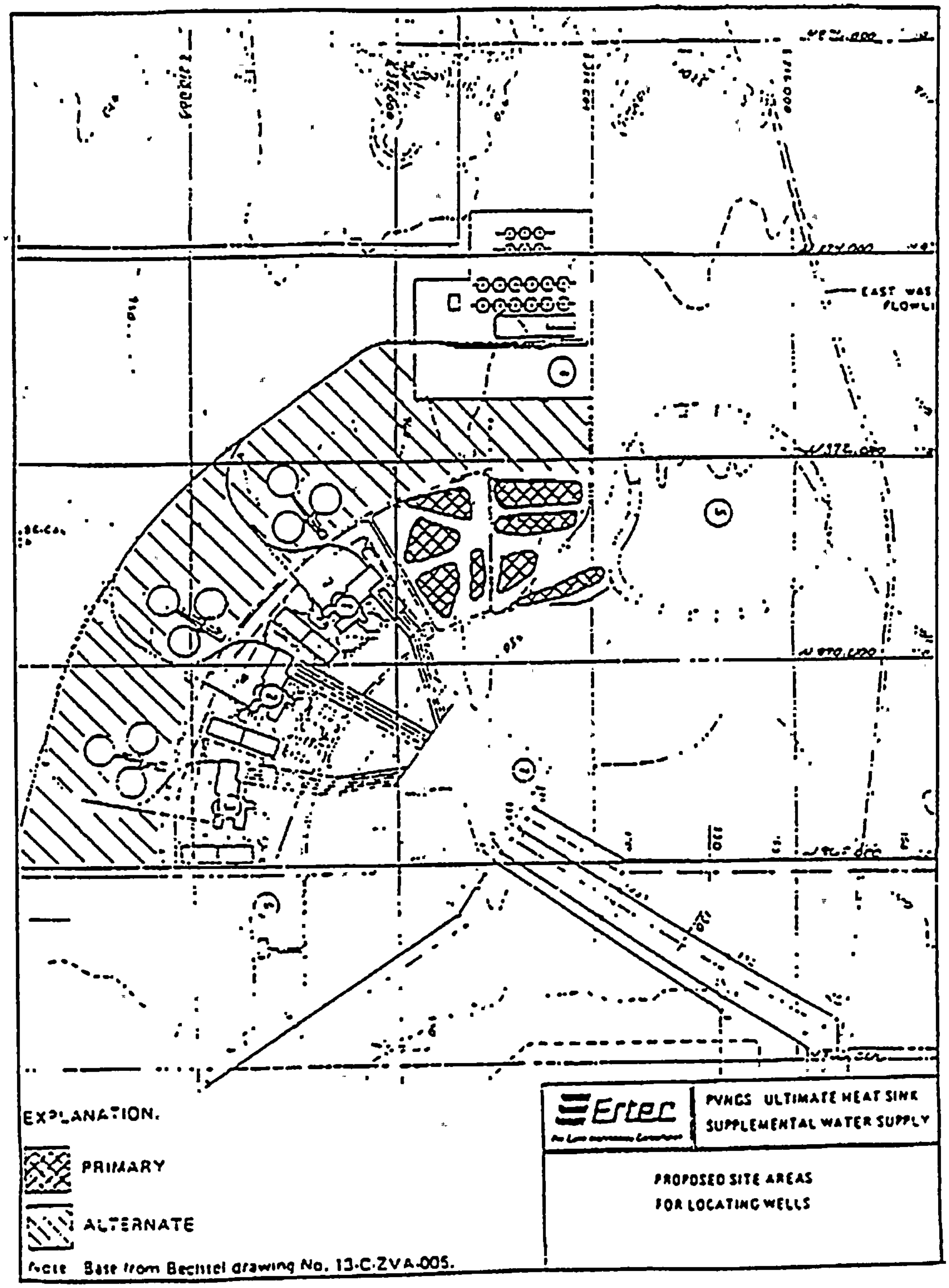
1.8 Ensure that a supply company capable of delivering temporary piping is mobilized.

1.9 Identify alternate routes to the site from Phoenix or possible equipment air lifts.

1.10 Determine the extent of damage to the 2 normal production wells 34abb and 27ddc and the standby well 27cbc with work initiated to restore the normal production wells and the standby well to service.

1.11 Reference the ERTEC drawing on the next page for well site selections.

2.0 Ertec Drawing



Appendix N - EOF Diesel Generator Operations

1.0 EOF diesel generator startup

1.1 On loss of power to the EOF, verify that both normal (1E-NAN-S06 source) and emergency (1E-NAN-S05) AC power is not available, by communicating with the Control Room of an unaffected Unit (there should be an LOP or Trouble on both the 1E-NAN-S05 and S06 buses). If power is verified to be out and it has been decided not to evacuate to the Backup EOF, then continue with this procedure. EOF maps included after the procedure steps may be of assistance.

NOTE

Immediately notify the Administrative & Logistics Coordinator if any problems are encountered in the conduct of this procedure. It may become necessary to evacuate the EOF.

1.2 Verify installation of the 4/0 (minimum) ground conductor between the generator breaker box and the ground lug provided beneath receptacle AE-NZN-I01.

1.3 Verify installation of the secondary trailer ground conductor between the trailer frame (tongue end) and the grounding conductor of transformer A-E-NGN-L51X.

1.4 Verify installation of the generator power cable plug to receptacle AE-NZN-I01. The keyway in the plug receptacle assembly ensures proper circuit phasing is maintained. Secure the plug to the receptacle using the integral receptacle fasteners.

CAUTION

The following step is critical to personnel safety and equipment protection. THIS STEP SHALL BE COMPLETED PRIOR TO THE APPLICATION OF GENERATOR POWER. This action isolates AEZYNDOX20 (PDP-E) panel loads from the building electrical distribution system, allowing alignment to the diesel generator.

1.5 With concurrent verification, at panel A-E-NZN-D0X-08 (EDP), open the circuit breaker marked "PDP-E MAIN BKR AEZYNDOX20" - "Main Panel PDPE" (this is the bottom breaker in this panel). All other breakers in this panel are to remain closed.

1.6 With concurrent verification, open all circuit breakers at distribution panel AEZYND0X20 (PDP-E).

1.7 With concurrent verification, unlock and close Safety Switch AE-NZN-U0X-02. [lock combination is 1796].

1.8 With concurrent verification, place the Safety Switch padlock upon door handle pin of panel A-E-NZN-D0X-08 (EDP) to secure and lock the door in the closed position.

1.9 Start the diesel generator as described below. The mechanical controls are located on the left side of the engine-generator trailer, on the engine itself.

NOTE

If the diesel will not start or run acceptably, notify the Administrative & Logistics Coordinator. It may be necessary to prepare to evacuate the EOF.

1.10 Locate the Engine Start switch. This switch is a push-to-turn, spring return to normal type, marked HEAT-OFF-START, that controls both the diesel glow plug pre-heating and the engine starter.

1.11 Push in, turn the switch to the left (CCW, to the HEAT position), and hold the switch in this position to preheat the diesel cylinders. Approximate preheat time requirements are described below:

Outside temperature	Pre-Heat Time
Above 60 degrees F	None
Below 60 degrees F to 32 degrees F	1 minute
Below 32 degrees F	2 minutes

1.12 Release the switch, then push-turn to the right (CW, to the START position) to start the engine. Release the switch when the engine commences to run.

1.13 Adjust the throttle (CW) adjacent to the starting switch as required to bring the engine to running speed, as indicated by the Voltage (490-500 VAC) and Frequency (61-63 Hz) Meters on the Generator Output Breaker Control Panel. This panel is located on the rear right side of the engine-generator trailer.

1.14 If radiological conditions permit, allow two minutes of unloaded run time before closing the generator output breaker and loading the generator.

1.15 With concurrent verification, close the generator AC output breaker (open the electrical box and push the breaker handle upward).

1.16 With concurrent verification, at Distribution Panel AEZYND0X20 (PDP-E), close the following breakers: Air Compressor CHC-1, Air Handler AO-1, Filter RFU-1, LPB Panel EOF, Mech. Equip. Rm Exhaust Fan EF-11, Pump No. 5 P-5, Chiller No. 2 C-2.

2.0 EOF HVAC system restart

NOTE

These steps assume that the EOF ventilation system is operating in the filtration mode and the cooling tower CT-1 is operating or available.

2.1 With concurrent verification, locate the Cooling Tower CT-1 Filter Isolation Valves V103 and V104. Verify they are in the open position (with handles parallel to the piping).

2.2 With concurrent verification, at Cooling Tower Control Panel AJZYNE05, verify the selector switch to (or set it to) position CT-1.

2.3 With concurrent verification, at Panel AEZYND0X20 (PDP-E) close the circuit breakers for pump P-2 and cooling tower CT-1.

2.4 With concurrent verification, at the control panel on Main Chiller #1, AMZYNE0X1, press the selector (rocker type) switch to STOP/RESET.

2.5 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

2.6 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

2.7 Check generator voltage and frequency at Control Panel; adjust throttle as required to maintain frequency above 60 Hz.

2.8 Return to EOF and report to Administrative and Logistics Coordinator that power has been restored.

2.9 OPTIONAL - Operational performance of the Air Handling Unit AEZYNA0X01 can be determined by observing the temperature differential between temperature indicators TI-0024 (chilled water return) and TI0025 (chilled water supply). After 5 minutes of chiller operation, the temperature of TI-0024 should be greater than TI-0025. The thermometer-type temperature indicators are mounted at eye level on the respective chilled water lines indicated above. See the "Building Arrangement" sketch 2 of 2 in this procedure for their approximate physical location in the room.

3.0 Brown-out

In the event that a diesel generator overload condition is detected (generator output current approaching 300 Amperes, or if "brown-out" conditions are detected in the EOF, perform the following steps:

3.1 Obtain the master key from the key box in EOF room #7.

3.2 Inside the EOF pump room (Room #14 - left wall) locate distribution panel LPB (AEZYNDOX14), and open the panel. Open breakers #31 through 42. This sheds the EOF duct heaters from the generator load.

3.3 If necessary, locate panel RBA (AEZYNDOX12) inside the telephone equipment room on the left side of the EOF Command Center (left wall). Open breakers #24, 26, 28, and 30. The master key will also open the room door if locked.

3.4 Re-check the generator load current at the engine panel to confirm the load demand is within acceptable limits.

3.5 Return the master key to the key box in Room #7.

4.0 Brown-out restoration

To restore the original conditions before the load-shed was accomplished:

4.1 Obtain the master key from key box in EOF Room #7.

4.2 Locate distribution panel LPB; re-close breakers #31 through 42.

4.3 Locate distribution panel RBA; re-close breakers #24, 26, 28, and 30.

4.4 Return the master key to the key box in room #7.

5.0 Restoring normal power.

NOTE

If available, Electrical Maintenance may be requested to perform the power restoration described below.

5.1 Notify the Administrative & Logistics Coordinator before diesel shutdown and power restoration. A short duration power outage of the EOF is required to perform realignment of the feeder circuit.

5.2 Verify that offsite power is available and has remained stable for 15 minutes minimum, and that normal and/or emergency AC power is available at the transfer switch A-E-NZN-U0X-01.

5.3 With concurrent verification, open all circuit breakers on the distribution panel AEZYND0X20 (PDP-E).

CAUTION

The following step is critical to personnel safety and equipment protection. This step shall be completed prior to the restoration of normal power.

5.4 With concurrent verification, remove the lock from the door handle of panel A-E-NZN-D0X-08;

5.5 With concurrent verification, open and LOCK safety switch AE-NZN-U0X-02. This isolates the diesel generator from the building power distribution system.

5.6 With concurrent verification, in the EDP panel [A-E-NZN-D0X-08], close the breaker feeding the PDP-E panel. This breaker is located at the bottom of the EDP panel

5.7 With concurrent verification, close all the breakers in distribution panel AEZYND0X20 (PDP-E), including those of the elevator and the water heater.

5.8 With concurrent verification, at the Control Panel for Back-up Chiller #2, AMZYNE0X2, turn the selector switch CCW to the STOP-EMERGENCY-RESET position.

5.9 With concurrent verification, return the Selector Switch CW to the AUTO OPERATION position. The chiller should restart within 5 minutes.

6.0 Shutting down the diesel engine:

6.1 Confirm that the EOF has been reconnected to the normal/emergency source(s) of off-site power.

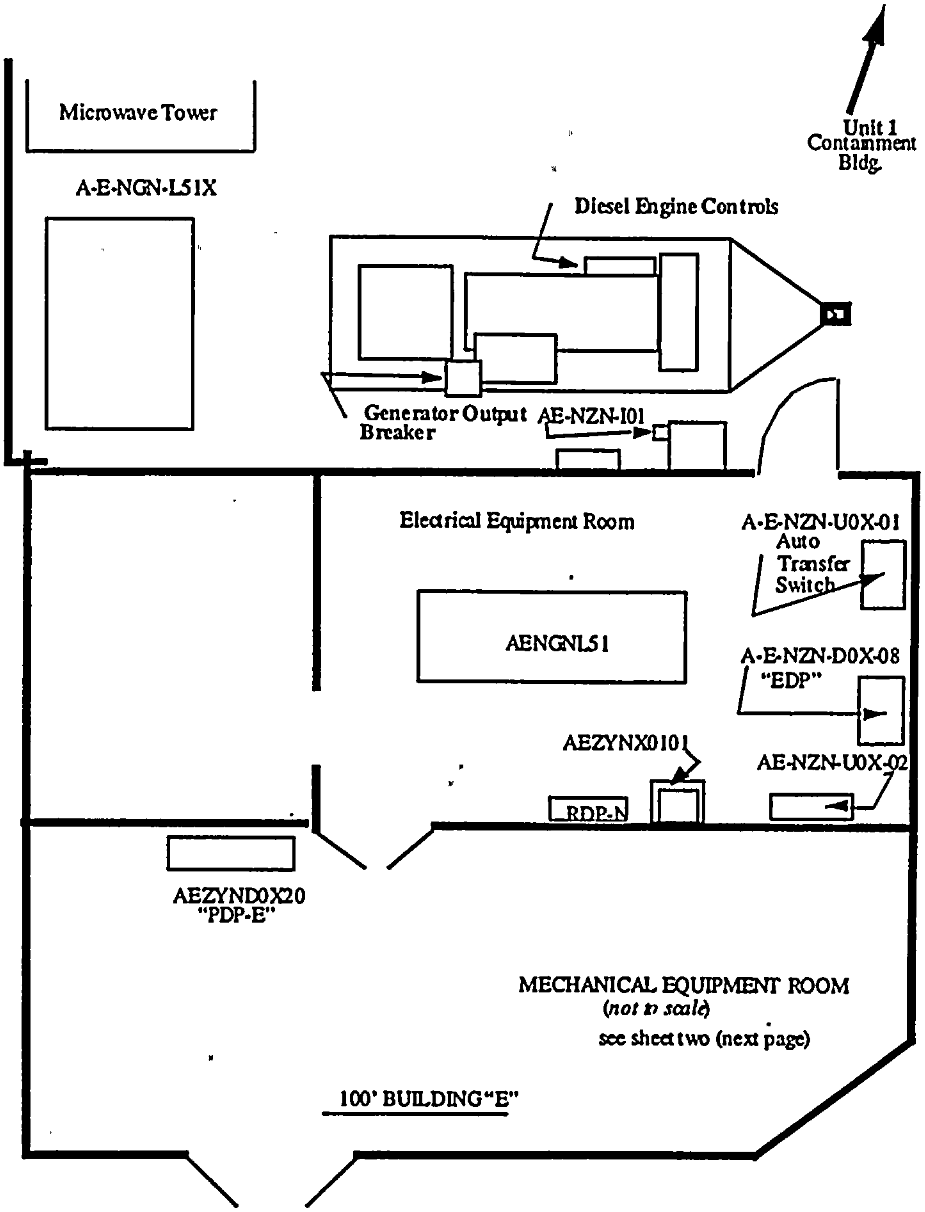
6.2 Return the throttle to the idle (approximately vertical) position.

6.3 Locate the STOP lever on the left side of the engine generator trailer (physical location is to the left of the starting switch). Rotate the lever approximately 30 degrees CW; this shuts off the fuel supply to the engine. Hold the lever in place until the engine is fully stopped, then release the stop lever.

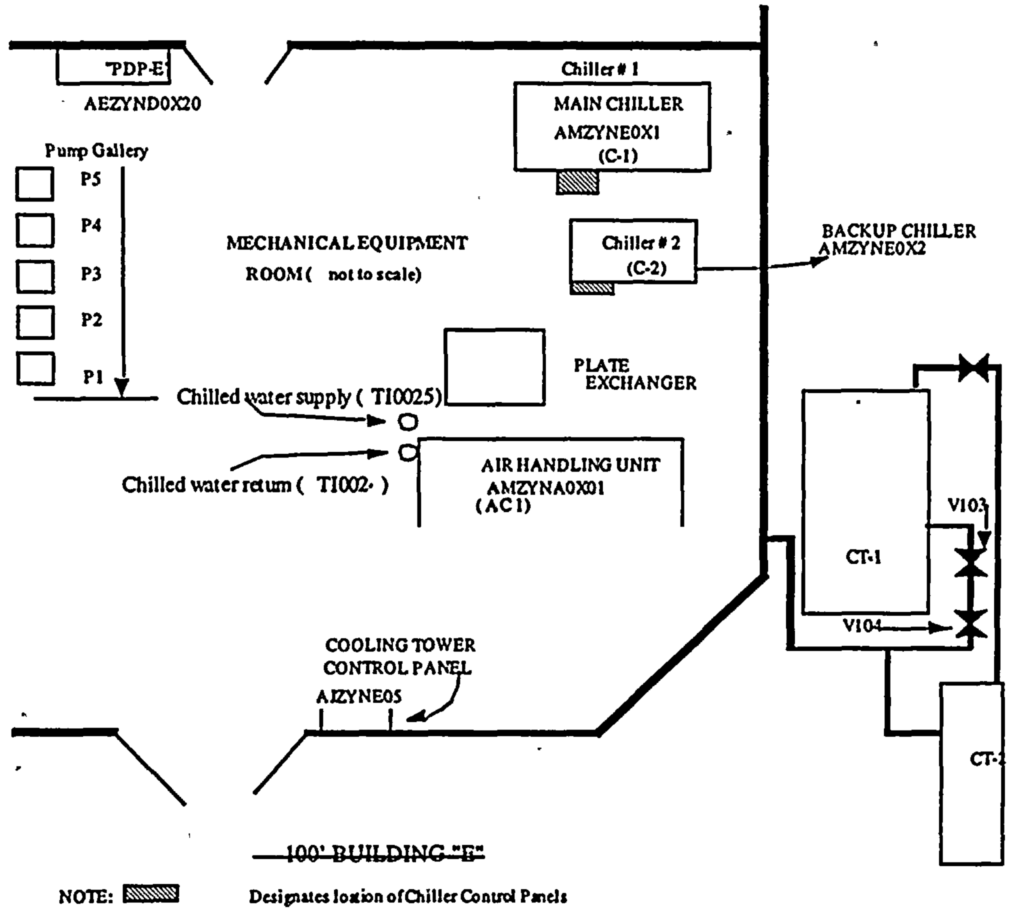
6.4 With concurrent verification, open the diesel generator AC output circuit breaker.

6.5 Notify the Administrative & Logistics Coordinator that power transfer has been completed.

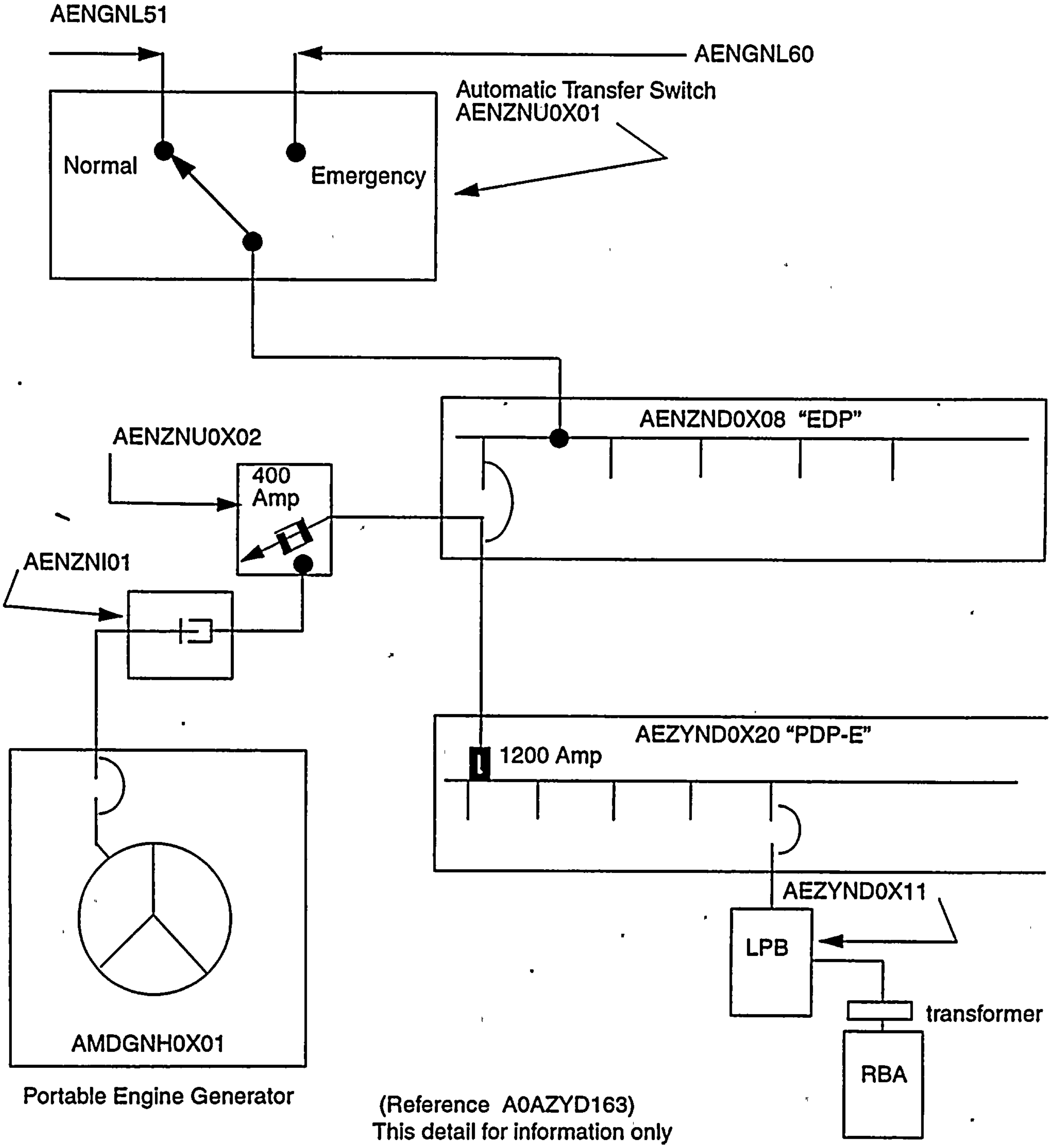
Building Arrangement & Equipment Location (1 of 2)



Building Arrangement & Equipment Location (2 of 2)



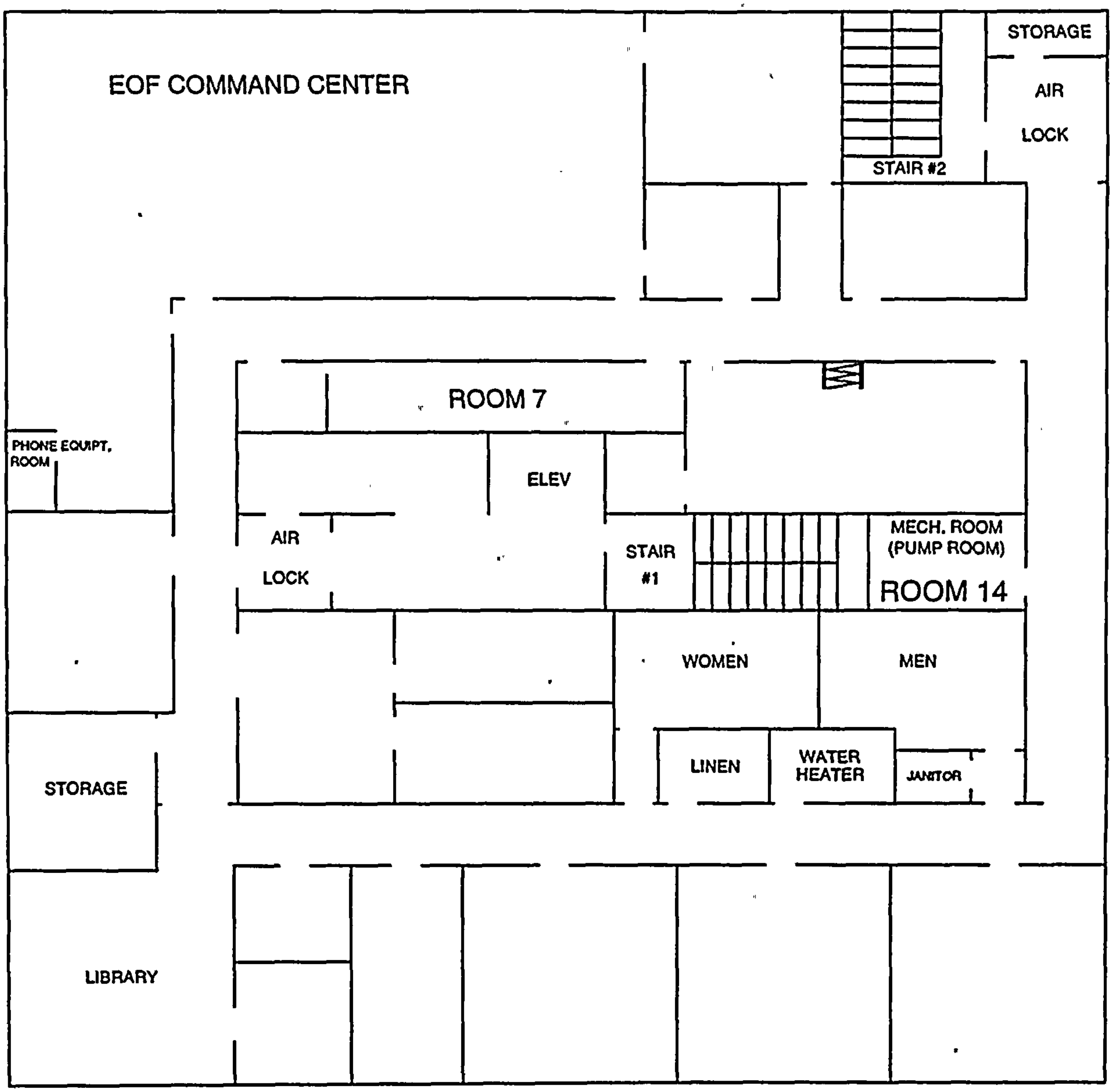
Wiring Schematic



Portable Engine Generator

(Reference A0AZYD163)
This detail for information only

EOF Floor Plan



Appendix O - ERFDADS operation

1.0 Noteworthy items:

1.1 ERFDADS is comprised of the following 4 sections:

1.1.1 SPDS Displays Menu

1.1.2 P&ID Menu

1.1.3 Thermal Performance (not addressed in this Appendix)

1.1.4 System Function Displays Menu

1.1.5 User Displays Menu (not addressed in this Appendix)

1.2 The mouse used for cursor positioning is optical in nature, making it sensitive to mouse pad orientation and mouse pad cleanliness. Food or drink should not be consumed near ERFDADS workstation areas.

1.3 If all data values on any display turn magenta, Operations Computer Systems (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

1.4 If the system appears to be functioning incorrectly or becomes locked up, the system should be rebooted.

1.5 Help is available from almost anywhere within the ERFDADS display regions. It can generally be accessed from the top menu bar by selecting the option with the left mouse button. A "Help" window will appear containing help for those items accessible within the main window in focus.

1.6 Top Menu Bar Functions

1.6.1 FILE

1.6.1.1 Reset Display: Redraws the current display back to defaults

1.6.1.2 Clear: Erases the current display except for the menu bars

1.6.1.3 Print Window Laser: Prints in black and white (this is the fastest printing option)

1.6.1.4 Enh Prnt Wndw Lsr: Prints an enhanced printout

1.6.1.5 Print Window Color: Prints a color printout

1.6.1.6 Quit: Ends the current mmi session and returns to the desktop

1.6.2 Edit: Allows use of cut and paste functions

1.6.3 OPTIONS

1.6.3.1 Point List: Lists all available ERFDADS points (~3000)

1.6.3.2 Trend List: lists all user-defined trends / groups

1.6.3.3 Logon: Allows access to controlled-access functions

1.6.3.4 Logoff: Allows logoff to prevent unauthorized access

1.7 Bottom Menu Bar Functions

1.7.1 Top Menu: Returns to the top main mmi display

1.7.2 Screen Up: Decrements 1 screen display

1.7.3 Screen Down: Increments 1 screen display

1.7.4 Previous Screen: Returns to the last displayed screen

1.7.5 Silence: Silences any Level 1 or Level 2 audible alarm

1.7.6 Audible List: Displays all points currently in alarm status

1.7.7 Text Input Box: Allows entry for a trend display name

1.8 MMI Menu Bar Functions: The mmi Menu Bar Functions are accessed by selecting the gray bar at the top of the current window with the right mouse button. The following options can be selected with the right mouse button from the drop-down menu:

1.8.1 Close: Reduces the mmi window to an icon

1.8.2 Full Size: Maximizes the current window to full-screen

1.8.3 Move: Allows for dynamic window positioning

1.8.4 Resize: Allows for dynamic window sizing

1.8.5 Back: Changes focus to other windows currently open

1.8.6 Refresh: Redraws the last display with the current time

1.8.7 Quit: Ends the current mmi session and returns to the desktop

1.9 Workspace Menu Functions: Workspace functions are accessible by closing the mmi window to an icon and selecting a point anywhere within the light blue background area with the right mouse button. The following options can be selected with the right mouse button from the pop-up menu:

1.9.1 Restart ERFDADS: Automatically shuts down and restarts the system

1.9.2 ERFDADS MMI: Allows opening of up to 4 mmi windows concurrently

1.9.3 ERFDADS CSF: Allows opening of a new SPDS window

1.9.4 Remote RMS: Opens RMS display for "Unit 1 (RED)", "Unit 2 (YELLOW)", or "Unit 3 GREEN)"

1.9.5 Print Tool: Allows spooling a SUN file to any of several printers

1.9.6 Print Window Laser: Allows black & white printout from a colored window

1.9.7 PTARS: Allows view / edit of post-trip trend data

1.9.8 Kill PTARS: Stops PTARS and returns to blank workspace display

1.9.9 Exit: Shuts down the system and returns to "Logon" display

1.10 SPDS Menu Functions: SPDS displays are configured to allow for monitoring of critical safety functions, to allow for event diagnosis and classification, and to notify Control Room personnel with messages similar to control board annunciators. 101 displays are available. Movement between multiple page displays can be performed by using the "Up / Down" buttons located toward the bottom of the display. The SPDS Display Menu consists of 2 pages listing the following options:

1.10.1 Critical Safety Functions: Contains 10 selections to allow operators to evaluate CSF criteria

1.10.1.1 Critical Safety Functions: Overall list of the individual critical safety functions

1.10.1.2 FR Safety Func Tracking: Allows tracking of the above functions

1.10.1.3 Safety Func Status Check: Shows status of the above functions

1.10.1.4 Reactivity Control: One of the critical safety functions

1.10.1.5 Vital Auxiliaries: One of the critical safety functions

1.10.1.6 Press Control: One of the critical safety functions

1.10.1.7 Heat Removal: One of the critical safety functions

1.10.1.8 CTMT Integrity: One of the critical safety functions

1.10.1.9 CTMT Atmos: One of the critical safety functions

1.10.1.10 Inventory Control: One of the critical safety functions

1.10.2 Safety Injection Delivery: Contains 4 selections to provide equipment status:

1.10.2.1. HPSI Curve: Displays HPSI pump curve based on current parameters

1.10.2.2 LPSI Curve: Displays LPSI pump curve based on current parameters

1.10.2.3 Train A/B SI: Displays current status of pumps / valves and parameters

1.10.3 Operator Information: contains 5 selections to aid operators:

1.10.3.1 Event Classification: Suggests event classifications based on parameters

1.10.3.2 Personalities: Allows selecting Control Room Supervisor, Primary Operator, or Secondary Operator

1.10.3.3 SPDS Overview: Provides an overview of SPDS

1.10.3.4 PZR Cooldown: Shows pressurizer cooldown rate in deg F/hr and 15 minute averages

1.10.3.5 RCS Cooldown: Plots 15-minute average primary cooldown rates

1.10.3.6 Multi-Input: Displays pages of multi-input parameters for SPDS

1.10.3.7 Rad Monitors: Summary of current radiation levels

1.10.3.8 RCS P/T - NPSH Curve: Displays RCP parameters with typical NPSH curves

1.10.3.9 ERDS Link: Allows activation of the ERDS link to the USNRC

1.11 Advisory Messages: At the bottom of each SPDS display are 5 buttons corresponding to 5 message sets the operator can use for immediate notification of system, component, or parameter status. Each can be displayed in 1 of 5 colors representing a hierarchy of importance. When a monitored parameter reaches a given message setpoint, the button holding the message set for that parameter will change to 1 of 5 colors and the message will be displayed within the bounds of the specified button. The 5 colors and their importance are represented as follows:

1.11.1 Red: Urgent informational messages

1.11.2 Yellow: Caution informational messages

1.11.3 Green: Important informational messages

1.11.4 Blue: Time-dependent informational messages

1.11.5 White: Helpful informational messages

1.12 Operator EOP Support: This area of the Safety Parameter Display System consists of a series of pages used to assist Control Room Operators in monitoring the status of the plant for each Emergency Operating Procedure. Following a reactor trip, ERFDADS will evaluate which event is occurring. When the "Overview" button is selected with the diagnosed EOP message, the system will display the diagnosed EOP display for that section. The diagnosis cannot be overridden. The diagnosed EOP support display must be escaped and the EOP support display for the desired EOP must be accessed. Each operator has access to selected pages in the EOP support area pertaining to the specific operator function relative to his/her Control Room position. These pages are consistent with plant equipment and parameters intended for that portion of the EOP a specific operator is currently performing. When a safety function is not satisfied, the Functional Recovery Procedure will be diagnosed by ERFDADS and the operators would begin monitoring the screens specific to that EOP.

1.13 P&ID Functions: P&ID displays organize system parameter data into a graphical layout of the system and provide the current data for each parameter associated with each layout. The 43 displays currently available are separated into similar categories - primary systems, secondary systems, electrical systems, etc. To access a system, select the P&ID box from the top menu. A display will appear with all the major systems categorically organized. Selecting a display will present that system along with most of the available ERFDADS points associated with that given system and the current status of each point. To view a trend of a specific parameter, select the given parameter's value. Either the attributes (analog or digital) display will appear or a multi-input display for a calculated point (SPDS point) will appear. If the multi-input display appears, select the point again for the attributes display. Selecting the "Trend-1" button located at the lower left portion of the attributes screen will display a trend for that specified point. To return to the system display, select "Previous Screen" twice (selecting the gray screen title button returns to the main P&ID display). Data is displayed in the P&ID screens using the following format:

1.13.1 Green: Reliable value

1.13.2 Magenta: Failed validity check

1.13.3 White: Suspect data

1.13.4 Orange: Exceeded a rate-of-change setpoint

1.13.5 Yellow: Exceeded a HI or LO setpoint (Level 2)

1.13.6 Red: Exceeded a HI-HI or LO-LO setpoint (Level 1)

1.13.7 Cyan: Manually input data

1.14 The following selections, attributes, displays, and options are available from the System Function Displays Menu:

1.14.1 Alarm Mode Selection - This option changes the mode for which alarms are determined. Modes available are Modes 1-6 and Harsh Containment. The calculation is normally performed automatically, but can be overridden by Control Room Supervision via a logon password.

1.14.2 Analog Point Attributes - This option displays the current value for any analog ERFDADS point. Also provided is information on associated instrumentation and alarm values, if appropriate. Calculated points will list, in addition, the calculations and point values which are used to determine the SPDS point.

1.14.3 Archive Copy - For normal post-trip actions, the active PTARS file can be copied to the secondary PTARS file and the active 14-hour file, to the secon-dary 14-hour file. 15 minutes should be allowed for the copy procedure to complete. Data archived in this manner can only be accessed from the server it was saved to. Copying of files with this option is also allowed for DAT tape backup purposes. All archive operations from this option can be performed at any time, regardless of reactor status.

1.14.4 Archive Retrieval - This function is used to retrieve data for ERFDADS graphs and is different than PTARS retrieval. Output from 7 available files can be viewed as trend graphs, X-Y plots, tabular lists of values, or ASCII files.

1.14.5 Audible Alarm Configuration - (function available only to OCS personnel)

1.14.6 Demand Scan - Use this selection when data for a single point (analog or digital) is needed for any single point in time. Since the result is a "snapshot" of current conditions at the time it was invoked, the value will not change. This is in contrast to the analog / digital point attributes function, which maintains a continuing update of a specified value as it changes over time.

1.14.7 Digital Point Attributes - Functions identical to the Analog Point Attributes Function, except for digital points (i.e., valve / breaker / pump states) only. Alarms can also be assigned for this option following the same procedure as discussed previous. However, since digital points monitor 2 states (0 or 1), the only value gained would be alarming pump start / stop, valve open / close, or breaker open / close.

1.14.8 ERDS Communication Link - This option is used to activate the Emergency Response Data System link to USNRC Operations Center. Instruction for use is discussed in the Emergency Response Data System Instructional Guide.

1.14.9 External Health Interface - This option is used to monitor the status of communications links from ERFDADS to QSPDS, RMS, and ERDS for errors.

1.14.10 Group Update - This function allows the user to group sets of points for display as a group trend (up to 4 points per group), group bar chart (up to 6 points per group), or a tabular display (up to 24 points per page). Group trends default to the preset range and must be changed every time they are invoked if the range was not valid. This is in contrast to user trends, which are saved with the range selected by the user and will always be loaded into memory with that range.

1.14.11 Log Information Update - This option allows the user to retrieve a saved set of data that will display the current status and current parameter value when invoked. The data can also be spooled to a printer.

1.14.12 Log Summary - The summary contains a listing of user configured files which can be used for log information update. Selecting a file name from the menu will display the particular data input for that file.

1.14.13 Message Retrieval - Use this function to monitor error and system messages. Of the 6 messages, the Primary Alarm is the most useful choice, which will invoke a listing of all alarms that have occurred. Also displayed will be the time each has occurred and the time each has cleared (if relevant), the value that caused (and cleared) the alarm, and the type of alarm (Level 1 / Level 2). By specifying a filter, the user can select which alarms to display based on the plant system designator. The time frame available, however, is limited to the current active 14-hour file.

1.14.14 Password Update - Passwords can be changed from this option. Access is limited to Operations Computer Support personnel only.

1.14.15 Point Summaries - This summary provides a list used to check the status of various points, such as those alarming, those which have their alarm function bypassed, those which have an audible alarm assigned, those removed from scan, those assigned manually substituted values, or those currently without valid values. Separate listings exist for analog and digital points.

1.14.16 System Health - This function is used to monitor the status of all ERFDADS terminals having the ability to access the specific Unit's data (18 terminals).

1.14.17 Tabular Display - Selecting this option invokes a tabular listing of up to 24 points per page, each of which will list the point name, description, and the current value with units of measurement.

1.14.18 Unit / Server Switch - This option is used to change the Unit or server from which to receive data. 2 redundant servers exist, of which each is capable of performing all functions in the event that the other server is no longer capable of performing its function. Each STSC terminal in a specified Unit should be linked to a different server. When server changes are made and the "Apply" option is selected from the pop-up window, the white highlighted text will shift to the new server selected and the switching is completed. When switching Units, compliance with the pop-up message box is required. The user must wait approximately 1 minute for confirmation that the change has occurred prior to continuing.

2.0 Troubleshooting the System

2.1 Mouse Will Not Move or Moves Slowly - The mouse used for cursor positioning is optical in nature, making it sensitive to mousepad orientation and mousepad cleanliness. Rotate the mousepad 90º and clean the pad. Ensure that the mouse connector to the keyboard is fully inserted. Ensure that the keyboard connector to the computer is fully inserted.

2.2 System is Responding Extremely Slowly - The most likely cause is that both terminals are linked to the same server. Ensure that each terminal is linked to a different server. If the problem persists, exit the system on 1 terminal and log back on. Repeat this procedure for the other terminal.

2.3 Fatal Error Message Received When Trying to Retrieve Data - Verify that the correct date and time were entered and that the correct data file is being used for the date and time desired. For example, this error may occur if the user is attempting to retrieve data 18 hours old from the 14-hour file. This error can also occur when a user selects a PTARS data file and 1 of the points displayed is not a PTARS point. In this case, the invalid point should be deleted or a different data file type should be selected. Server shifts can also occur after performing an archive copy. The cause for this is unknown, but the user should ensure that the server the terminal is linked to remains the same after the copy is performed. If it is not, the terminal should be switched back to its original server.

2.4 MMI Display has Disappeared - Search for an mmi icon at the bottom of the current display. If found, reopen the window with a double-click on the icon with the left mouse button. If no icon is found, select a point anywhere within the light blue background area with the right mouse button. This action will invoke the Workspace Menu. Select "ERFDADS MMI" if listed or "Restart ERFDADS" if it is not.

2.5 Data is Missing From the Point List / Trend List - This error message can occur when trying to invoke a trend list or when trying to transmit a trend to 1 of the terminals in the Control Room. If an error message stating that no files can be found or that the file cannot be sent, the link to that module has most likely been lost. The system must be rebooted to reconnect all file links.

2.6 All Data Values on a Display Turn Magenta - 1 or both DAS Units have crashed. Invoke the "System Health" display from the "System Functions" Menu and view the status of the DAS Units. If only 1 unit is unavailable, switch to the available server. If both DAS Units are unavailable, the system is unavailable and is not accessible from any of the units. Contact 1 of the other Units to ensure availability of meteorological data. Operations Computer Support (OCS) personnel should be notified immediately for corrective action. The inability to correct this condition may require a USNRC notification due to loss of Emergency Response Data System transmission capabilities.

2.7 Auto-Logout Message Received - This is a normal message that is received when 5 minutes have elapsed after performing a logon to activate ERDS or to perform an Archive Copy. The automatic logoff occurs to prevent unauthorized access should the user leave the area. Auto-Logout has no effect on system capabilities.

2.8 Color to Black & White Prints Not Working - If the correct screen print is not occurring (i.e., a zoomed icon picture prints), ensure that the mmi icon is reopened within 8 seconds. The "Snapshot" program incorporates an 8-second delay to allow the user to select the desired window. When the 8 seconds have timed out, the next item which is selected will print.

2.9 System Appears to Function Incorrectly or is Locked Up - Perform a system reboot.

3.0 System shutdown

If it becomes necessary to shut down the system for the purpose of rebooting, perform the following actions:

3.1 Close the "mmi" window by selecting the "down arrow" button toward the upper left portion of the display with the left mouse button.

3.2 Invoke the "Workspace Menu" by selecting a point anywhere within the light blue background area with the right mouse button.

3.3 Select "EXIT" from the "Workspace Menu" with the right mouse button.

4.0 System startup

If the system accepts no mouse commands, perform the following actions to start up the system:

4.1 Press the <STOP> and <A> keys simultaneously.

4.2 From the "Options" List, type N (new) at the ">" Prompt. (This display may not appear.)

4.3 Press <Return>.

4.4 When the "Type Help for more information" message appears, type sync on the "OK" Line.

4.5 Press <Return>.

4.6 At the Login Display, type ERFDADS (or the STA Login ID) and press <Return>.

4.7 At the "Password" display, press <Return>.

5.0 ERDS Transmission Data Set

POINT ID	DESCRIPTION	POINT ID	DESCRIPTION
ARF38	Condenser Air Removal Flow	SPDS 0093	RCS T-Cold Loop 1A
CPF42	Plant Vent Exhaust Flow	SPDS 0094	RCS T-Cold Loop 1B
HFF93	Fuel Building Exhaust Flow	SPDS 0095	RCS T-Cold Loop 2A
RDL10	Reactor Cavity Sump Level	SPDS 0096	RCS T-Cold Loop 2B
RDL410	CTMT Sump Level East	SPDS 0109	Time Since Reactor Trip
RDL411	CTMT Sump Level West	SPDS 0143	Wind Speed - 35' 15-Minute Avg
SEJ1AA	Excore Log Power Channel A	SPDS 0144	Wind Direction - 35'
SEJ1BB	Excore Log Power Channel B	SPDS 0146	Atmospheric Stability Class
SENIS1	Excore StartUp Power Channel 1	SPDS 0194	Estimated Core Flow - lb/m Avg
SENIS2	Excore StartUp Power Channel 2	SPDS 0203	Charging Flow
SIL706	CTMT Recirculation Sump A Level	SPDS 0215	LPSI A Flow
SIL707	CTMT Recirculation Sump B Level	SPDS 0216	LPSI B Flow
SPDS 0001	Pressurizer Pressure	SPDS 0217	HPSI Flow to Loop 1A
SPDS 0002	CTMT Pressure	SPDS 0218	HPSI Flow to Loop 1B
SPDS 0003	S/G #1 Pressure	SPDS 0219	HPSI Flow to Loop 2A
SPDS 0004	S/G #2 Pressure	SPDS 0220	HPSI Flow to Loop 2B
SPDS 0005	S/G #1 Actual Wide Range Level	SPDS 0606	RU-004 10-Minute Avg
SPDS 0006	S/G #2 Actual Wide Range Level	SPDS 0607	RU-005 10-Minute Avg
SPDS 0007	Auxiliary Feedwater Flow to S/G #1	SPDS 0635	RU-139A 10-Minute Avg
SPDS 0008	Auxiliary Feedwater Flow to S/G #2	SPDS 0636	RU-139B 10-Minute Avg
SPDS 0009	CTMT Temperature	SPDS 0637	RU-140A 10-Minute Avg
SPDS 0013	Log / Linear Reactor Power	SPDS 0638	RU-140B 10-Minute Avg
SPDS 0015	Reactor Vessel Level - Head	SPDS 0639	RU-141 10-Minute Avg
SPDS 0016	Reactor Vessel Level - Plenum	SPDS 0640	RU-143 10-Minute Avg
SPDS 0017	RCS T-Hot Loop 1	SPDS 0643	RU-145 / 146 10-Minute Avg
SPDS 0018	RCS T-Hot Loop 2	SPDS 0644	RU-148 10-Minute Avg
SPDS 0021	Subcooling Margin	SPDS 0645	RU-149 10-Minute Avg
SPDS 0052	RWT Level	SPDS 0671	RU-155D 10-Minute Avg
SPDS 0054	Actual Pressurizer Level	SPDS 5035	S/G #1 Feed Flow Rate
SPDS 0079	Representative CET	SPDS 5036	S/G #2 Feed Flow Rate
SPDS 0082	CTMT Hydrogen Concentration		

Appendix P - Recovery Organization

1.0 Noteworthy items

1.1 Recovery operations may initiate when the plant is in a controlled and stable condition. No action should be taken to disturb this condition without express approval of the Recovery Manager.

1.2 Long term post-emergency efforts that follow a major incident are a functional responsibility of the Recovery Organization and can be performed by PVNGS and other Arizona Public Service Company personnel, contract experts and specialists, and qualified engineers under the direction of the Recovery Organization.

1.3 The Emergency Operations Director, filled by the Vice President - Nuclear Production, or designated alternate, will assume the duties and responsibilities of the Recovery Manager and, with the advice of the Emergency Coordinator, will be responsible for implementing the direction in this document. S/he will have overall corporate responsibility for restoring the Unit to a normal operating configuration.

1.4 This document should be referenced when the Emergency Operations Director has determined that recovery operations are necessary to perform the following activities:

1.4.1 Identify the extent of station damage and radiological contamination

1.4.2 If appropriate, return the station to an operating status in compliance with Technical Specifications

2.0 Recovery actions

2.1 Notify affected offsite emergency management organizations (via NAN) and the USNRC (via FTS-2000 ENS) that recovery operations are in progress.

2.2 Request attendance in the Emergency Operations Facility to form the Recovery Organization by assigning available management personnel per the Recovery Organization Chart. Alternates can be utilized if positions cannot be filled by prescribed management individuals.

2.3 Direct Joint Emergency News Center personnel to conduct a final news briefing for the event and to facilitate the transfer of press operations to Arizona Public Service Media Relations.

2.4 Establish recovery operations by assessing the following issues during the implementation meeting:

2.4.1 Status of plant / site conditions, accessibility to contaminated areas, the need for additional decontamination, condition of plant equipment

2.4.2 Recovery of plant buildings or areas

2.4.3 Personnel exposures

2.4.4 USNRC involvement / interface

2.4.5 Level of offsite support required

2.4.6 Assignment of work groups, tasks, staffing, etc.

2.4.7 Logistics support - documentation, information flow, etc.

2.4.8 Preliminary damage estimates

2.5 For known or suspected significant plant damage, survey teams may be formed consisting of Operations, Engineering, Maintenance, and Radiation Protection personnel to ascertain the extent of physical damage and to identify areas of contamination and high radiation. Results of the surveys should be used by the Recovery Manager, the Station Operations Manager, and the Radiological Services Manager to plan the approach for repairing and returning the Unit to operation.

2.6 Under direction of the Recovery Manager, the Recovery Organization and selected offsite personnel, if applicable, should address the planning and coordination of the recovery effort. Activities such as the maintenance and repair of existing plant systems and/or components, modifications, installations, and decontamination should be discussed, prioritized, and planned. The need for portable shielding and special procedures should be addressed, as well.

2.7 Actual recovery operations may commence upon identification and prioritization of assessed issues, finalization of the recovery plan, development of special procedures, if necessary, and allocation of adequate repair equipment. The Recovery Manager will ensure that applicable personnel are properly trained prior to implementation of recovery operations. Training material should be developed and training conducted for specialized tasks identified.

2.8 In addition to specialized requirements in place, normal Unit / plant practices shall be followed regarding maintenance, repair, modification, installation, decontamination, and personnel exposure control.

2.9 The Radiological Services Manager should develop plans to process and control radwaste, estimate total population dose on a periodic basis in conjunction with state and federal authorities, and coordinate activities of staff Radiological Engineers and Radiation Protection personnel.

2.10 The Station Operations Manager should oversee in-plant operations on a daily basis. During recovery operations, s/he will be responsible for ensuring that plant repairs and modifications optimize post-recovery plant operational effectiveness and safety. Maintenance and Work Control Management will support the Station Operations Manager with required maintenance and repair work.

2.11 The Nuclear Support Manager should focus necessary engineering and contract resources on aspects of plant recovery requiring redesign or modification.

2.12 The Technical Support Manager should provide work analyses, guidelines, and procedures in direct support of plant operations.

2.13 The Quality Assurance Manager will ensure that the overall conduct of recovery operations is performed in accordance with corporate policy and regulations governing activities which may affect the health and safety of the public.

2.14 The Administrative / Logistics Manager will supply administrative, logistic, communications, and personnel support for the recovery operation.

2.15 The PVNGS Communications Manager should coordinate the flow of information to the media concerning recovery operations.

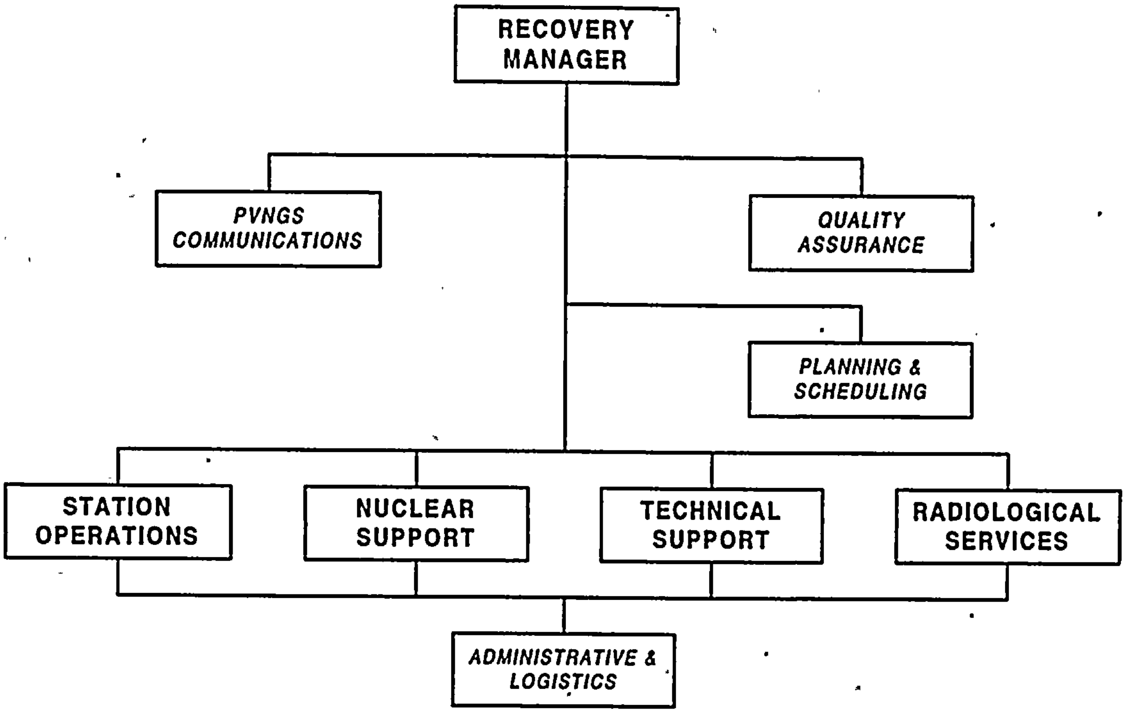
2.16 The Planning / Scheduling Manager will develop an overall schedule to guide the recovery effort.

2.17 During the course of recovery operations, unforeseen issues encountered shall be evaluated and factored into the overall recovery plan and the schedule adjusted accordingly.

2.18 Upon completion of recovery operations and prior to commencement of normal plant operations, Unit Technical Specification compliance shall be verified.

2.19 Upon completion of recovery operations, each Recovery Organization member shall submit all written documentation to the Recovery Manager, who will ensure it is forwarded to PVNGS Emergency Planning.

3.0 Recovery Organization Chart



RECOVERY ORGANIZATION	PVNGS RESPONSIBLE DEPARTMENT
RECOVERY MANAGER	EOD (Senior Vice President - Nuclear)
PVNGS COMMUNICATIONS	Strategic Communications
QUALITY ASSURANCE	Nuclear Assurance
PLANNING & SCHEDULING	Outage Department-Scheduling
STATION OPERATIONS	Operations
NUCLEAR SUPPORT	Nuclear Engineering / Projects
TECHNICAL SUPPORT	Operations Support
RADIOLOGICAL SERVICES	Radiation Protection
ADMINISTRATIVE &.LOGISTICS	Nuclear Materials Management and Budgets
Italicized positions are not required as a prerequisite for formation and activation of the Recovery Organization	

Appendix Q - EAL Technical Bases

1.0 EAL TECHNICAL BASES

1.1 Introduction

1.1.1 Purpose of EAL Bases

1.1.1.1 This document was developed to provide a single source of information related to the Palo Verde Nuclear Generating Station emergency action levels. It describes the intention and technical basis for each emergency action level used to classify plant related emergencies.

1.1.1.2 Emergency action levels are plant specific indications, conditions, or instrument readings which are utilized to classify emergency conditions as defined in the PVNGS Emergency Plan. This Emergency Action Level Bases Document has been developed to facilitate the review process for revisions to the PVNGS Emergency Classification Procedure, provide historical documentation and justification for reference purposes, and to provide training to operators and decision makers that will enhance their comprehension of emergency classification.

1.1.2 Significance of EAL Bases

1.1.2.1 Not only is it necessary to know when to declare an emergency, but it is also important to know the proper level of emergency to declare. Declaration of too low an emergency classification could result in a failure to mobilize the resources necessary to deal with a degrading plant condition. Declaration of too high an emergency classification could cause unwarranted public concern and hardship. There is no single criterion which can be used to determine the exact emergency classication for a given event or plant condition. NUMARC/NESP-007 lists a number of example initiating conditions for each of the emergency classifications. All of the emergency action levels in the PVNGS Emergency Classification Procedure are based on these initiating conditions.

1.1.2.2 Emergency action levels are, for the most part, symptom based. The action level is defined by values of key plant operating parameters which identify emergency or potential emergency conditions. This approach allows the full scope of variations in the types of events to be classified as emergencies. But, a purely symptom based approach is not sufficient to address all events for which emergency classification is appropriate. Therefore, events to which no predetermined symptoms can be ascribed are also utilized as emergency action levels since they may be indicative of potentially more serious conditions not yet fully realized. Moreover, other events are selected for inclusion as emergency action levels to ensure compliance with applicable regulatory guidance, particularly Regulatory Guide 1.101.

1.1.2.3 This document ties together the aspects of emergency response implementation to the plant specific characteristics of the Palo Verde Units. By providing a detailed description of the technical basis for each action level as well as a reference to the source requirement for the action level, this document should aid those people who need to make classification decisions.

1.1.3 Scope of bases

1.1.3.1 The EALs are addressed within section 1.0 in the order by which they appear in the PVNGS Emergency Classification Procedure, each on a separate page. The page format is also explained in section 1.0. The emergency classification which should result from the initiating condition represented by the EAL is given in the upper right corner. EALs dealing with barriers or releases are usually symptom based, while others may be event oriented. The technical basis for the EAL is provided in detail, followed by references to source documents as well as NUMARC/NESP-007. In cases where PVNGS procedures were used as a reference for the technical basis, Unit 1 procedures (indicated by a "1" as the second digit of the procedure number as in 41EP-1EO01) were used to develop the technical basis. It is not anticipated that there would be differences between unit specific procedures of a magnitude or nature sufficient to affect the development of the bases. Section 1.3 contains a matrix referencing EALs from NUMARC/NESP-007 to PVNGS Emergency Classifications.

1.1.4 Regulatory requirements and guidance

1.1.4.1 The current regulatory position on nuclear power plant emergency classification methods can be found in Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50). Specifically, 10 CFR 50.47(b)(4) states: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures."

1.1.4.2 10 CFR 50 Appendix E IV (c) states: "The entire spectrum of emergency conditions that involve the alerting or activating of progressively larger segments of the total emergency organization shall be described. The communication steps to be taken to alert or activate emergency personnel under each class of emergency shall be described. Emergency action levels (based not only on onsite and offsite radiation monitoring information, but also on readings from a number of sensors that indicate a potential emergency, such as the pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described. The existence, but not the details, of a message authentication scheme shall be noted for such agencies. The emergency classes defined shall include: (1) notification of unusual events, (2) alert, (3) site area emergency, and (4) general emergency. These classes are further discussed in NUREG-0654; FEMA-REP-1."

1.1.4.3 NUREG-0654/FEMA-REP-1, Rev. 1, Planning Standard II.D., states: "1. An emergency classification and emergency action level scheme as set forth in Appendix 1 must be established by the licensee. The specific instruments, parameters, or equipment status shall be shown for establishing each emergency class in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class.
2. The initiating conditions shall include the example conditions found in Appendix 1 and all postulated accidents in the Final Safety Analysis Report (FSAR) for the nuclear facility." Essentially, Appendix 1 of NUREG-0654 is one of the gauges to which emergency classification methods are measured. Revision 2 of Regulatory Guide 1.101, Emergency Planning and Preparedness of Nuclear Reactors, endorsed NUREG-0654.

1.1.4.4 Regulatory Guide 1.101, Revision 3 states: "The nuclear utility industry has now a decade of experience in adapting the NRC guidelines to develop sets of site-specific EALs and in using these EALs in exercises and under actual accident conditions. During this period, licensees have developed, offsite emergency response authorities have agreed upon, and the NRC has approved sets of EALs that represent broad variations in the ways the guidance in NUREG-0654 can be applied. It is possible that two plants, faced with identical conditions and applying their EAL schemes, would declare different levels of emergency (different ECLs). Also, there have been situations that were not contemplated when the guidelines were written and plant personnel were without specific guidance on which ECL to declare. ...In some cases, inconsistencies among initiating conditions together with broad ranges of risks with an initiating condition have resulted in some licensees declaring inappropriate ECLs.
In view of this experience, the Nuclear Management and Resource Council, Inc. (NUMARC) formed a task force to conduct a study to develop a systematic approach and support basis for development of emergency action levels. The methodology that was developed from this effort is described in NUMARC/NESP-007, Rev. 2, Methodology for Development of Emergency Action Levels, January 1992. NRC staff has reviewed the NUMARC methodology and considers it to be an acceptable alternative method to that described in NUREG-0654."

1.1.4.5 NUMARC/NESP-007, Revision 2 states: "This methodology develops a set of generic EAL guidelines, together with the basis for each, so that they can be used and adapted by each utility on a consistent basis. The review of the industry's experiences with EALs, in conjunction with regulatory considerations, was applied directly to the development of this generic set of EAL guidelines. The generic guidelines are intended to clearly define conditions that represent increasing risk to the public and can give consistent classifications when applied at different sites." PVNGS staff agrees with the NRC acceptance of the NUMARC methodology and adopts the guidance contained in NUMARC/NESP-007 as an alternative method to that described in NUREG-0654 for the development of emergency action levels (EALs).

1.1.5 Fission Product Barrier EAL Criteria

1.1.5.1 PVNGS Emergency Action Levels formulated according to the barrier based classification philosophy. As such, the ultimate emergency classification resulting from following PVNGS Emergency Action Levels will be based on combinations of EALS. These combinations are compiled using Table 4 of NUMARC/NESP-007 and are based on the following barrier criteria:

1. Notification of Unusual Event (NUE)

   Any loss OR any potential loss of Containment

2. Alert (ALERT)

   Any loss OR any potential loss of either Fuel Clad or RCS

3. Site Area Emergency (SAE)

   Loss of both Fuel Clad and RCS

   OR Potential loss of both Fuel Clad and RCS

   OR Potential loss of either Fuel Clad or RCS AND loss of any additional barrier

4. General Emergency (GE)

   Loss of any two barriers

   AND Potential loss of a third barrier

1.1.5.2 Although the logic used for the initiating conditions in PVNGS Emergency Action Levels appears overly complex, it is necessary to reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier. Notification of Unusual Event (NUE) initiating conditions associated with Fuel Clad and RCS Barriers are addressed under the LEAKAGE and MALFUNCTION Emergency Action Levels in PVNGS Emergency Action Levels.
- At the Site Area Emergency (SAE) level, there must be some ability to dynamically assess how far present conditions are from General Emergency. If Fuel Clad Barrier and RCS Barrier "Loss" EALs existed, this would indicate to the Emergency Operations Director (EOD) that, in addition to offsite dose assessments, continual assessments of radioactive inventory and containment integrity must be focused on. However, if both Fuel Clad Barrier and RCS Barrier "Potential Loss" EALs existed, the EOD would have more assurance that there was no immediate need to escalate to a General Emergency (GE).
- The ability to escalate to higher emergency classification levels as an event gets worse must be maintained. For example, RCS leakage steadily increasing would represent an increasing risk to public health and safety.

1.1.5.3 If a "Potential Loss" or "Loss" of a barrier in PVNGS Emergency Action Levels appears imminent (i.e., within 1 to 2 hours), a classification should be made as if the affected threshold(s) are already exceeded, particularly for the higher emergency classification levels.

1.2 Classification Criteria

1.2.1 Classification Criteria preface

1.2.1.1 NUREG-0654 FEMA REP-1 provides the definitions of each of the four emergency classifications as well as example initiating conditions which are indicative of each. The definitions provided in NUREG-0654 FEMA REP-1 are somewhat ambiguous in application and the example initiating events are not symptomatically definable or applicable in all cases.

1.2.1.2 There are three considerations related to emergency classification levels:

1. The potential impact on radiological safety, either as now known or as can be reasonably projected.
2. How far the plant is beyond its predefined design, safety, and operating envelopes.
3. Whether or not conditions that threaten health are expected to be confined to within the site boundary.

1.2.1.3 The following pages incorporate the four emergency classification level definitions as delineated within NUREG-0654. Additional discussion is provided on threshold determinations to eliminate ambiguities and to help clarify the intent of each of the emergency classification levels.

1.2.2 Notification of Unusual Event (NUE)

1.2.2.1 "Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occur."

1.2.2.2 Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant technical specification Limiting Condition for Operation (LCO) allowable action statement time for achieving required mode change. Precursors of more serious events should also be included because precursors do represent a potential degradation in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency classification level, however, releases do not require monitoring or offsite response (e.g., dose consequences of less than 10 millirem).

1.2.3 Alert

1.2.3.1 "Events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guideline exposure levels."

1.2.3.2 Rather than discussing the distinguishing features of "potential degradation" and "potential substantial degradation", a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency classification level is warranted, or whether de-escalation or termination of the emergency classification declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels (i.e., about 10 millirem to 100 millirem).

1.2.4 Site Area Emergency (SAE)

1.2.4.1 "Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels except near the site boundary."

1.2.4.2 The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines of NUMARC/NESP-007, clearly addresses NRC and offsite emergency response agency concerns as to timely declaration of a General Emergency.

1.2.5 General Emergency (GE)

1.2.5.1 "Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area."

1.2.5.2 The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore should be interpreted to include radionuclide release regardless of cause. In addition, it should address concerns as to uncertainties in systems or structures, e.g., containment, response, and also events such as waste gas tank releases and severe spent fuel pool events postulated to occur at high population density sites. To better assure timely notification, EALs in this category must primarily be expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with potential loss of the third barrier constitutes a General Emergency.

1.3 NUMARC/PVNGS EAL Matrix

1.3.1 EAL Matrix Preface

1.3.1.1 NUMARC/NESP-007 provides information by Recognition Categories in the following outline:

- A - Abnormal Rad Levels / Radiological Effluent
- F - Fission Product Barrier Degradation
- H - Hazards and Other Conditions Affecting Plant Safety
- S - System Malfunction

1.3.1.2 Within NUMARC/NESP-007, the initiating conditions for each of the Recognition Categories A, H, and S are in the order of Unusual Event, Alert, Site Area Emergency, and General Emergency. For Recognition Category F, the barrier-based EALs are presented in Table 4 (PWR).

1.3.1.3 PVNGS, as delineated in Emergency Action Levels and this EAL Technical Bases document, takes a like approach insofar as emergency classification order is concerned. However, PVNGS Emergency Action Level Event Categories have been outlined in a manner consistent with past practices due to human factors considerations. PVNGS Emergency Action Level Event Categories conform to NUMARC/NESP-007 criteria with the exception that PVNGS Emergency Action Levels further detail the EALs categorically. PVNGS Emergency Action Levels incorporate NUMARC/NESP-007 Recognition Category F as the Fission Product Barrier Reference. This layout is equivalent to the PWR-Table 4 of NUMARC/NESP-007 with the exception that the sub-columns and associated EALs for "Loss" and "Potential Loss" have been transposed due to human factors considerations. The three remaining NUMARC/NESP-007 Recognition Categories (i.e., A, H, S) are directly related to the seven PVNGS Event Categories under the following regime and comprise the rest of the PVNGS Emergency Action Levels :

- Electrical
- Radiological
- Leakage
- Malfunctions
- Hazards
- Security
- Miscellaneous

1.3.1.4 The matrix is entitled NUMARC/NESP-007 to PVNGS EAL Cross-Reference, where entries are categorized and sequenced according to NUMARC/NESP-007. This arrangement applies to Recognition Category sequence as well as emergency classification level hierarchy. A relation to the PVNGS Emergency Action Level Technical Bases can be found within the tables of PVNGS Emergency Action Levels, where the PVNGS EAL Identification Code associated with each EAL is embedded within each respective EAL Unit and corresponds to the PVNGS EAL Technical Bases number where the basis for the particular Emergency Action Level can be found. The matrix, together with PVNGS Emergency Action Levels, is intended to provide for an uncomplicated method to quickly relate EALs from one document to their counterparts in the other.

1.3.1.5 Specific NUMARC/NESP-007 Emergency Action Levels cross-referenced as "N/A" within the following tables signify no applicability of the generic EAL to PVNGS. These items are noted as exclusions to NUMARC/NESP-007 and are catalogued in section 1.4 of this document along with a basis for each exclusion.

1.3.2 EAL Matrix

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AU1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AU1-3	N/A			
AU1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AU2-1	Table 3:	RADIOLOGICAL:		Row 6
AU2-2	Table 3:	RADIOLOGICAL:		Row 6
AU2-3	N/A			
AU2-4	Table 3:	RADIOLOGICAL:		Row 5

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
AA1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-2	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AA1-3	N/A			
AA1-4	Table 3:	RADIOLOGICAL:		Row 3, Row 4
AA2-1	Table 3:	RADIOLOGICAL:		Row 6
AA2-2	Table 3:	RADIOLOGICAL:		Row 6
AA2-3	Table 3:	RADIOLOGICAL:		Row 6
AA2-4	Table 3:	RADIOLOGICAL:		Row 6
AA3-1	Table 3:	RADIOLOGICAL:		Row 6
AA3-2	Table 3:	RADIOLOGICAL:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AS1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AS1-2	N/A			
AS1-3	Table 3:	RADIOLOGICAL:		Row 4
AS1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category A - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
AG1-1	Table 3:	RADIOLOGICAL:		Row 1, Row 2
AG1-2	N/A			
AG1-3	Table 3:	RADIOLOGICAL:		Row 4
AG1-4	Table 3:	RADIOLOGICAL:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - FUEL CLAD BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	Fuel Clad:		Row 2
3	Table 1:	Fuel Clad:		Row 1
4	Table 1:	Fuel Clad:		Row 2
5	Table 1:	Fuel Clad:		Row 3
6	N/A			
7	Table 1:	Fuel Clad:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - RCS BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	RCS:		Row 1
3	Table 1:	RCS:		Row 2
4	N/A			
5	Table 1:	RCS:		Row 3
6	Table 1:	RCS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category F - CONTAINMENT BARRIER				
NUMARC/NESP-007	PVNGS PROCEDURES			
1	N/A			
2	Table 1:	CTMT:		Row 1, Row 2, Row 4
3	Table 1:	CTMT:		Row 3
4	Table 1:	CTMT:		Row 4
5	Table 1:	CTMT:		Row 3
6	Table 1:	CTMT:		Row 5
7	N/A			
8	Table 1:	CTMT:		Row 6

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HU1-1	Table 2:	HAZARDS		Row 7
HU1-2	Table 2:	HAZARDS		Row 8
HU1-3	Table 2:	MISCELLANEOUS:		Row 1
HU1-4	Table 2:	HAZARDS		Row 4
HU1-5	Table 2:	HAZARDS:		Row 2
HU1-6	Table 2:	HAZARDS:		Row 6
HU1-7	Table 2:	HAZARDS:		Row 9
HU2-1	Table 2:	HAZARDS:		Row 1
HU3-1	Table 2:	HAZARDS:		Row 5
HU3-2	Table 2:	HAZARDS:		Row 5
HU4-1	Table 2:	SECURITY:		Row 1
HU4-2	Table 2:	SECURITY:		Row 1
HU5-1	Table 2:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
HA1-1	Table 6:	HAZARDS:		Row 7
HA1-2	Table 6:	HAZARDS:		Row 8
HA1-3	Table 6:	HAZARDS:		Row 4
HA1-4	Table 8:	MISCELLANEOUS:		Row 1
HA1-5	Table 6:	HAZARDS:		Row 3
HA1-6	Table 6:	HAZARDS:		Row 6
HA1-7	Table 6:	HAZARDS:		Row 9
HA2-1	Table 6:	HAZARDS:		Row 1
HA3-1	Table 6:	HAZARDS:		Row 5
HA3-2	Table 6:	HAZARDS		Row 5
HA4-1	Table 7:	SECURITY:		Row 1
HA4-2	Table 7:	SECURITY:		Row 1
HA5-1	Table 6:	HAZARDS:		Row 2
HA6-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HS1-1	Table 7:	SECURITY:		Row 1
HS1-2	Table 7:	SECURITY:		Row 1
HS2-1	Table 6:	HAZARDS:		Row 2
HS3-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category H - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
HG1-1	Table 7:	SECURITY:		Row 1
HG1-2	Table 7:	SECURITY:		Row 1
HG2-1	Table 8:	MISCELLANEOUS:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - NOTIFICATION OF UNUSUAL EVENT *(NUE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SU1-1	Table 2:	ELECTRICAL:		Row 1
SU2-1	Table 5:	MALFUNCTIONS:		Row 4
SU3-1	Table 5:	MALFUNCTIONS:		Row 3
SU4-1	N/A			
SU4-2	Table 3:	RADIOLOGICAL:		Row 7
SU5-1	Table 4:	LEAKAGE:		Row 1, Row 2
SU6-1	Table 5:	MALFUNCTIONS:		Row 5, Row 6
SU7-1	Table 2:	ELECTRICAL:		Row 2

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - ALERT				
NUMARC/NESP-007	PVNGS PROCEDURES			
SA1-1	Table 2:	ELECTRICAL:		Row 2
SA2-1	Table 5:	MALFUNCTIONS:		Row 1
SA3-1	Table 5:	MALFUNCTIONS:		Row 2
SA4-1	Table 5:	MALFUNCTIONS:		Row 3
SA5-1	Table 2:	ELECTRICAL:		Row 1

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - SITE AREA EMERGENCY *(SAE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SS1-1	Table 2:	ELECTRICAL:		Row 1
SS2-1	Table 5:	MALFUNCTIONS:		Row 1
SS3-1	Table 2:	ELECTRICAL:		Row 3
SS4-1	Table 5:	MALFUNCTIONS:		Row 3
SS5-1	Table 5:	MALFUNCTIONS:		Row 2
SS6-1	Table 5:	MALFUNCTIONS:		Row 4

NUMARC/NESP-007 to PVNGS EAL Cross-Reference				
Recognition Category S - GENERAL EMERGENCY *(GE)*				
NUMARC/NESP-007	PVNGS PROCEDURES			
SG1-1	Table 2:	ELECTRICAL:		Row 1
SG2-1	Table 5:	MALFUNCTIONS:		Row 1

1.4 Exclusions to NUMARC/NESP-007

The EALs in the EXCLUSIONS TO NUMARC/NESP-007 Section are addressed ***in the order by which they appear in NUMARC/NESP-007*** and the basis and justification for exclusion of each NUMARC EAL will begin on a new page. The format of each page will comply with the following regime:

APP MODE: **MODES x - x**

CLASS: **xxxxx**

CATEGORY: **[A, F, H, S]** *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

EXCLUSIONARY BASIS:

(The full technical basis supporting the exclusion of the EAL from PVNGS Emergency Action Levels and any other information and/or justification regarding the basis)

SOURCE DOCUMENT:

(The source document(s) used as reference for the exclusionary basis)

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.

3. Valid reading on perimeter radiation monitoring system greater than 0.10 mR/hr above normal background for 60 minutes [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AU1-1, AU1-2, and AU1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected Increase in Plant Radiation or Airborne Concentration.

3. (Site-specific) radiation reading for irradiated spent fuel in dry storage.

EXCLUSIONARY BASIS:

PVNGS does not incorporate spent fuel dry storage facilities in its design. Reliance on spent fuel temporary storage capabilities is accomplished in the Spent Fuel Pool and is addressed by AU2-1, AU2-2, and AU2-4. This EAL is excluded from the PVNGS EAL scheme because no spent fuel dry storage modules exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.

3. A valid reading on perimeter radiation monitoring system greater than 10.0 mR/hr sustained for 15 minutes or longer [for sites having telemetered perimeter monitors].

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AA1-1, AA1-2, and AA1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6 | *CLASS:* SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 100 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AS1-1, AS1-3, and AS1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: **MODES 1 - 6** ***CLASS:*** **GE**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.

2. A valid reading sustained for 15 minutes or longer on perimeter radiation monitoring system greater than 1000 mR/hr. [for sites having telemetered perimeter monitors]

EXCLUSIONARY BASIS:

PVNGS does not incorporate a perimeter radiation monitoring system in its design. Reliance on monitoring offsite gaseous releases is accomplished by Radiation Monitoring System *(RMS)* alarms, Chemistry sample analyses, and real-time dose assessment capabilities and is addressed by AG1-1, AG1-3, and AG1-4. This EAL is excluded from the PVNGS EAL scheme because no telemetered perimeter monitors exist on the site.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	***CLASS:*** N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Fuel Clad Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Fuel Clad Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Other (Site-Specific) Indications (Fuel Clad Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Fuel Clad Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of RCS Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the RCS Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4	***CLASS:*** N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

4. Containment Radiation Monitoring (RCS Barrier)

EXCLUSIONARY BASIS:

PVNGS incorporates in its design a containment particulate and gas radiation monitor *(RU-01)*, which consists of inlet and outlet sample paths coming from and returning to containment and a sample and instrumentation skid located outside containment in the East Electrical Penetration Room. Its sole purpose encompasses RCS leakage detection and is one of the three RCS leakage detection methodologies directed by site Technical Specifications. RU-01, however, becomes isolated from the containment atmosphere either as directed by plant procedures when an RCS leak is confirmed or automatically when containment pressure reaches the Containment Isolation Actuation Signal *(CIAS)* setpoint of 3.0 psig containment pressure. Since this method is designed for initial detection of RCS leakage, it is ineffective after the radiation monitor is isolated from the containment atmosphere. It cannot facilitate in the identification of "Loss" or "Potential Loss" of either the RCS Barrier or the Fuel Clad Barrier, since these fission product barrier thresholds would not be met until long after the radiation monitor has been isolated from the containment atmosphere which it monitors.

Two other radiation monitors, RU-148 and RU-149, which are the containment high range area monitors, would indicate off-scale LO readings under conditions warranting use of radiation monitoring when the reactor coolant noble gas and iodine inventory associated with normal operating concentrations *(i.e., within Tech Specs)* are assumed to be instantaneously released and dispersed into containment.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ14, Excessive RCS Leakrate, Rev. 03.01
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

1. Critical Safety Function Status (Containment Barrier)

EXCLUSIONARY BASIS:

PVNGS, a Combustion Engineering *(CE)* plant, does not incorporate Critical Safety Function Status Tree *(CSFST)* monitoring in its Emergency Operating Procedure *(EOP)* design. Reliance on monitoring safety function status is accomplished by PVNGS Procedure 41EP-1RO08, Functional Recovery, Appendix FA. Safety Function monitoring is also addressed by Control Room operators upon entry into PVNGS Procedure 41EP-1EO01, Emergency Operations, which is normally entered after a reactor trip event and used for event diagnosis. Safety function status monitoring uses the same parameters as depicted within the Fission Product Barrier Reference. Adequate monitoring, analysis, and diagnosis of Containment Barrier parameters are accomplished within the remainder of the Fission Product Barrier Reference Table and is addressed within the EAL scheme for the Containment Barrier. This EAL is excluded from the PVNGS EAL scheme because no Critical Safety Function Status Tree, nor any challenge classifications *(i.e., Yellow, Orange, and Red Paths)*, exist in the site's Emergency Operating Procedure design.

SOURCE DOCUMENT:

PVNGS Procedure 40DP-9AP05, Emergency Operating Procedures Technical Guideline, Rev. 00.07
PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

7. Other (Site-Specific) Indications (Containment Barrier)

EXCLUSIONARY BASIS:

This EAL encompasses other site-specific indications which could be used to signify a "Loss" or "Potential Loss" of the Containment Barrier. Specifically addressed are area or ventilation monitors in the containment "annulus" or other contiguous buildings. PVNGS Emergency Operating Procedures do not provide for containment venting as a method utilized to preclude conditions where a potential loss or loss of the containment barrier could occur. Under these conditions, the hydrogen recombiners would be put into service some 100 hours subsequent to a loss of coolant accident *(LOCA)* for purposes of addressing the potential hydrogen problem which may result from the LOCA. Containment venting is only performed during normal routine plant operations.

No additional site-specific qualitative methodologies exist which could augment or enhance the process of monitoring the Containment Barrier other than those specifically addressed within the Fission Product Barrier Reference Table.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10
PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.

1. (Site-Specific) radiation monitor readings indicating fuel clad degradation greater than Technical Specification allowable limits.

EXCLUSIONARY BASIS:

This EAL is not applicable to PVNGS due to incorporation of no failed fuel monitor within its design. However, RCS Letdown Radiation Monitor, RU-155D, is used for trend analysis in determining changes in RCS activity which would denote changes in fuel clad integrity. It is neither Technical Specification related nor is it to be used for quantification of fuel clad degradation. The sole function of RU-155D is to provide trend data as a basis for RCS sampling frequency.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
Engineering Calculation 13-JC-SQ-215, RE-155D, Total Loop Uncertainty and Setpoint, Rev. 0
PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 2
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 00.10
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5 PVNGS EAL Technical Bases

1.5.1 Introduction

The EALs in the Technical Bases Section are addressed on the following pages, ***not necessarily in the order by which they appear in Tables 1 through 8 of the procedure,*** and the technical composition for each will begin on a new page. The format of each page will comply with the following regime:

APP MODE: MODES x - x

CLASS: xxxxx

CATEGORY: [A, F, H, S] *(Recognition Category)*

NUMARC/NESP-007 INITIATING CONDITION:

(The IC and Example EAL(s) as presented in NUMARC/NESP-007)

PVNGS EMERGENCY ACTION LEVEL (EAL):

(The PVNGS specific EAL as presented in PVNGS Procedures)

LOCATION: PVNGS Emergency Action Levels - Table (1 through 8): (Category, Row)

TECHNICAL BASIS:

(The technical basis supporting the EAL as stated)

NUMARC DEVIATION:

(The deviation(s) to the NUMARC/NESP-007 EAL and justification)

SOURCE DOCUMENT:

(The source document(s) used as reference for the basis and deviation justifications)

(EAL number)

n-n

1.5.2 1-1

APP MODE: MODES 1 - 4 | *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Core Exit Thermocouple Readings

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Highest valid CET temperature > 700°F*

LOSS: *Highest valid CET temperature > 1200°F*

LOCATION: Table 1: FUEL CLAD / Row 1

TECHNICAL BASIS:

Maximum allowed RCS pressure is 2750 psia per PVNGS Technical Specifications Section 2.1.2. Maximum instrument error *(specified in 41EP-1EO01 Appendix S)* for RCX-PT-102x, wide range pressurizer pressure instrument, is ± 390 psi. Maximum actual system pressure is 3140 psia for an indicated pressure of 2750 psia. Saturation temperature for this pressure is 702°F. If one or more CETs indicate 700°F or higher, subcooling has been lost for at least some locations in the core. CET indications at or above 700°F are a clear sign that core heat removal capability is lost or greatly reduced and one fission product barrier, the fuel clad, is threatened due to elevated fuel temperatures. 700°F qualifies as a condition representing a "Potential Loss" of the Fuel Clad Barrier.

The 1200°F temperature constitutes a "Loss" of the Fuel Clad Barrier per NUMARC/NESP-007, Rev. 2. It indicates significant superheating of the coolant.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1EO01, Emergency Operations, Rev. 00.10, Appendix S, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-1

1.5.3 1-2 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: **[F]** Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Reactor Vessel Water Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RVLMS level < 21% plenum*

LOSS: *N/A*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Steam voids may form in the reactor vessel [outlet] plenum as a result of inventory loss, pressure drop, or inadequate heat removal from the core when core temperatures exceed saturation for RCS pressure following a reactor trip. During this period, cooling is typically via natural circulation. If void size cannot be controlled and the void extends into the reactor vessel outlet plenum, the heat removal process shifts from subcooled natural circulation to less efficient and non-preferred reflux boiling. Any indication of void formation requires immediate attention to control and/or reduce the size of the void and to maintain RCS heat removal capability. Voiding in the outlet plenum is most likely caused by loss of inventory or by loss of pressure control in the RCS. In either case, the fuel clad is threatened with perforation due to elevated centerline temperatures from the lower heat removal capability of reflux boiling compared to natural circulation.

The Reactor Vessel Level Monitoring System *(RVLMS)* is comprised of eight Heated Junction Thermocouples *(HJTC)* oriented vertically above the upper Fuel Alignment Plate *(FAP)* in the reactor vessel. As head and outlet plenum *(hot leg)* levels decrease, HJTCs begin to become uncovered, causing indicated temperatures for the affected HJTCs to rise as temperatures approach saturated conditions during development of the steam void. Indicated levels read out as incremental values on 1E Class instrumentation in the Control Room.

1-2

1.5.4 1-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Corresponding detector numbers and their respective indicated readings are as follows:

Detector Number Meter Reading

1 *(uncovered)* 67% head
2 *(uncovered)* 41% head
3 *(uncovered)* 16% head
4 *(uncovered)* 0% head
5 *(uncovered)* 73% plenum
6 *(uncovered)* 47% plenum
7 *(uncovered)* 21% plenum
8 *(uncovered)* 0% plenum

As can be seen, once Detector 8 becomes uncovered and detects saturated conditions, indicated level will proceed from 21% plenum to 0% plenum. From this point on, as vessel level continues to lower, it can no longer be discerned as to where actual reactor vessel water level is. The value chosen in this EAL conforms to the generic basis in that "< 21% plenum" indicates a potential loss of the Fuel Clad Barrier, as actual water level may be at the top of the active fuel, or below.

NUMARC DEVIATION:

While actual reactor vessel water level may be above the active region of the fuel after indicated water level reaches "0", it can no longer be determined exactly where actual level is when level continues to decrease. Conservatively, an assumption must be made at the time that vessel water level is AT the top of the active fuel.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ54, Monitoring the Reactor Vessel Inventory with RVLMS Inoperable, Rev. 01.02
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.5 1-3

APP MODE: MODES 1 - 4 **CLASS:** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Primary Coolant Activity Level

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *RCS activity > 300 μCi/gm Dose Equivalent I-131*

LOCATION: Table 1: FUEL CLAD / Row 2

TECHNICAL BASIS:

Due to the likelihood of fuel damage during an ATWS caused by fuel overheat due to either mechanical binding of stuck CEAs or Reactor Trip Switchgear Breaker failure, this EAL would be met if a chemistry sample analysis indicated that fuel damage exists, as signified by Dose Equivalent Iodine^{131} exceeding 300 μCi/gm. This amount of coolant activity is well above that expected for iodine spikes and corresponds to about 2% to 5% fuel clad damage, which indicates significant clad heating. Thus, the Fuel Clad Barrier is considered lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-3

1.5.6 1-4

APP MODE: MODES 1 - 4	CLASS: N/A
CATEGORY: [F] Fission Product Barrier Degradation	

NUMARC/NESP-007 INITIATING CONDITION:

5. Containment Radiation Monitoring

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *CTMT radiation monitor: RU-148 > 1.2E+06 mrem/hr or RU-149 > 1.8E+06 mrem/hr*

LOCATION: Table 1: FUEL CLAD / Row 3

TECHNICAL BASIS:

The containment HI range area monitors, RU-148 and RU-149, provide radiation accident condition information inside containment. Bechtel Calculation 13-NC-ZY-216 provides a basis to correlate the readings from RU-148/RU-149 to a Core Damage Fraction *(CDF)*. The calculation uses CESSAR Table 15.6.5-1 for Source Term and assumes that 100% of the Equilibrium Noble Gas and 25% of the Equilibrium Iodine are airborne in containment. Per this calculation, a CDF of 1% equates to readings of 1.2E+06 mrem/hr on RU-148 and 1.8E+06 mrem/hr on RU-149 and is based on 300 μCi/gm Dose Equivalent $Iodine^{131}$ in the containment atmosphere. An assumption in the calculation consists of a reactor shutdown 15 minutes ago, yielding an effective age of 0.25 hours. The corresponding readings for both radiation monitors differ slightly due to their respective physical locations within containment.

NUMARC DEVIATION:

NUMARC/NESP-007 specifies these values should be based on an "approximate" clad failure of 2%-5%, depending on core inventory and RCS volume. Cores associated with the PVNGS Units are larger than normal and the Bechtel Calculation assumes 1% clad failure with a LOCA to arrive at the values given for this EAL.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Procedure 74CH-9ZZ87, Iodine-131 Dose Equivalent Determination, Rev. 2
PVNGS Unit 1 Technical Specifications, Amendment 74
Bechtel Calculation 13-NC-ZY-216, Rev. 1
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Table 15.6.5-1
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-4

1.5.7 1-5

APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

7. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of Fuel Clad Barrier*

LOCATION: Table 1: FUEL CLAD / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Fuel Clad Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-5

1.5.8 1-6 (page 1 of 2)

APP MODE: MODES 1 - 4	***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. RCS Leak Rate

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *RCS leak > 44 gpm*
LOSS: *RCS leak rate > available makeup capacity as indicated by a loss of RCS subcooling (i.e., RCS at saturation conditions)*

LOCATION: Table 1: RCS / Row 1

TECHNICAL BASIS:

RCS leakage is the flow of any reactor coolant out through the RCS pressure boundary to any location by a means other than design flow or drainage of coolant as part of an authorized procedure. It may be detected by any or all of the following means:

- Increasing containment radiation levels or airborne activity levels.
- Increasing containment sump levels, temperature, pressure, or humidity.
- Increasing steam generator blowdown radiation levels or steam line radiation levels or steam generator activity.
- Increasing radiation levels, airborne activity levels, or sump levels in the auxiliary building.
- Decreasing RCS pressure or pressurizer level *(with no other transient in progress).*
- Reactor Coolant System leak rate determination.

Measurement of the rate may be made by an RCS inventory balance *(conducted at least every 72 hours in accordance with 40ST-9RC02, RCS Water Inventory Balance, or as part of Procedure 41EP-1RO02, Loss of Coolant Accident)* or by observation that pressurizer level continues to decrease with letdown isolated and one charging pump running in a normal configuration.

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any RCS leakage which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of RCS subcooling has occurred. The loss of RCS subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

1-6

1.5.9 1-6 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 40ST-9RC02, RCS Water Inventory Balance, Rev. 00.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.10 1-7 (page 1 of 2)

APP MODE: **MODES 1 - 4** ***CLASS:*** **N/A**

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. SG Tube Rupture

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *SGTR leak > 44 gpm*

LOSS: *SGTR > 132 gpm with a prolonged release of contaminated secondary coolant occurring from the ruptured S/G to the environment (see Limitations in Section 1)*

LOCATION: Table 1: RCS / Row 2

TECHNICAL BASIS:

The 44 gpm leak rate *(Potential Loss)* is based on the capacity of one running charging pump. Any SGTR event which requires a second charging pump to be started to maintain pressurizer pressure and level must be in excess of 44 gpm; therefore, the more conservative condition is also easier to identify.

The "Loss" EAL addresses ruptured S/Gs with an unisolable secondary line break corresponding to the loss of the RCS Barrier and the Containment Barrier. *(NOTE: the Containment Barrier loss is represented by the "Secondary Side Release with Primary-to-Secondary Leakage" EAL.)* This allows the direct release of radioactive fission and activation products to the environment. Since actual leak rate is a function of the offsite dose rates attainable for this event, 132 gpm is consistent with the diagnostic activities of the applicable Emergency Operating Procedure *(i.e., 41EP-1RO03, Steam Generator Tube Rupture)*. This includes indication of a primary coolant inventory reduction and increased secondary radiation levels. 41EP-1RO08, Functional Recovery, would be the applicable procedure for a SGTR along with an uncontrolled or complete depressurization of the ruptured S/G. Secondary radiation increases are observed via radiation monitoring of condenser off-gas, S/G blowdown, main steam, and/or S/G sampling. Determination of the "uncontrolled" depressurization of the ruptured S/G is based on indication that the pressure decrease in the ruptured S/G is not a function of normal operator actions. The Limitations Topic Area in PVNGS Emergency Action Levels, qualifies this part of the event. Emergency Operating Procedures direct the subsequent plant cooldown to take place utilizing steaming of the unaffected S/G. The "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization due to the same effect this action has on offsite dose rates in relation to dose rates caused by steam line breaks or stuck open S/G safety valve*(s)*.

1-7

1.5.11 1-7 (page 2 of 2)

NUMARC DEVIATION:

The charging pumps used at PVNGS are positive displacement pumps and each has a capacity of 44 gpm. Using a value of 44 gpm meets the intent of the "Potential Loss" NUMARC/NESP-007 EAL in that the requirement to start a second charging pump to conserve RCS inventory conforms to the generic basis of taking the action due to the inability to maintain normal RCS liquid inventory.

The "Loss" EAL conforms to NUMARC/NESP-007 generic guidance with the exception of where the "plant cooldown steaming affected S/G to atmosphere" is included as an uncontrolled depressurization, as referenced in the PVNGS Emergency Action Levels. This condition would involve a prolonged release of contaminated secondary coolant from the affected S/G to the environment if that affected S/G is utilized for plant cooldown to Mode 5 *(Cold Shutdown)* because plant Emergency Operating Procedures direct plant cooldown via steaming of the unaffected S/G to the condenser, which is the preferred path.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO03, Steam Generator Tube Rupture, Rev. 00.08
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.12 1-8

APP MODE: MODES 1 - 4	***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Other (Site-Specific) Indications

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *LOAF such that minimum acceptable feedwater flow cannot be maintained*

LOSS: *N/A*

LOCATION: Table 1: RCS / Row 3

TECHNICAL BASIS:

This EAL addresses the inability to initially remove heat from the RCS during early stages of an event, thereby jeopardizing the Heat Removal Safety Function. If emergency auxiliary feedwater flow *(and main feedwater flow)* required by design is insufficient to remove the amount of heat from at least one steam generator, an extreme challenge should be considered to exist and the RCS Barrier is potentially lost. Procedure 41EP-1RO05, Loss of All Feedwater, includes provisions for establishing feedwater flow to the S/G*(s)* under conditions where no flow could be established from the Control Room. A potential loss of the RCS Barrier exists if actions from outside the Control Room are required to establish or maintain minimum acceptable feedwater flow and all attempts from the Control Room to establish or maintain acceptable feedwater flow have been exhausted.

NUMARC DEVIATION:

This "Potential Loss" EAL meets the NUMARC/NESP-007 intent of other indications. The EAL includes a Control Room diagnosis that a loss of all feedwater condition exists with indications that feedwater flow to at least one S/G cannot be initiated or maintained from the Control Room.

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO05, Loss of All Feedwater, Rev. 00.07
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-8

1.5.13 1-9

APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of RCS Barrier*

LOCATION: Table 1: RCS / Row 4

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the RCS Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1-9

1.5.14 1-10 (page 1 of 2)

APP MODE: MODES 1 - 4 — *CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

2. Containment Pressure

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *Row 1: CTMT pressure 50 psig and increasing*
Row 2: CTMT pressure > 8.5 psig with both CTMT Spray Systems not operating
Row 5: H_2 concentration > 3.5% by volume

LOSS: *Row 1: Rapid unexplained CTMT pressure decrease following initial increase*
Row 2: CTMT pressure or sump level response not consistent with LOCA conditions

LOCATION: Table 1: CONTAINMENT / Row 1, Row 2, Row 4

TECHNICAL BASIS:

The only likely cause for a pressure excursion in containment at or exceeding 50 psig is a LOCA with failure of containment pressure control systems. CIAS setpoint is 3 psig. Containment Spray setpoint *(CSAS)* is 8.5 psig. In order for containment pressure to reach 50 psig, both Containment Spray trains must have already failed. Maximum allowed containment pressure by Technical Specifications is 2.5 psig. Design pressure is 60 psig. The proximity of containment pressure to design pressure, in combination with probable elevated containment air temperatures in the case of a LOCA and the demonstrated inability to control containment pressure, make the failure of containment likely. This "Potential Loss" EAL is included in PVNGS Emergency Action Levels to provide clear indication that containment integrity is threatened and to provide for a path of further escalation in the case of one or two fission product barriers already lost or threatened.

The likely source of hydrogen in containment is a LOCA into containment accompanied by severe fuel melt. A metal-water reaction of the zircalloy clad produces hydrogen in the core, which is then released into containment. Other possible sources include: radiolytic decomposition of post-LOCA emergency cooling solutions or corrosion of metals and paints by emergency cooling containment spray solutions. The conservative approach assumes that severe core damage is the source. Core damage and leakage of this magnitude clearly indicate a failure of two fission product barriers. Hydrogen levels of this magnitude in containment would likely be accompanied by elevated containment pressure and, with hydrogen approaching the lower flammable limit of 4%, would threaten containment integrity with a further pressure spike from a hydrogen burn. Rapid unexplained loss of containment pressure which is not directly attributable to containment spray or condensation effects following an initial pressure increase indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

1-10

1.5.15 1-10 (page 2 of 2)

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
PVNGS Unit 1 Technical Specifications, Amendment 74
NUREG/BR-0150, USNRC RTM-92, Response Technical Manual, Volume 1 Rev. 2, October 1992
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4

CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

5. Significant Radioactive Inventory In Containment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CTMT radiation monitor: RU-148 > 6.2E+09 mrem/hr or RU-149 > 8.7E+09 mrem/hr*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The readings associated with RU-148 and RU-149 are values which indicate significant fuel damage well in excess of the EAL associated with loss of the Fuel Clad Barrier. A major release of radioactivity requiring offsite protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant. Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a "Potential Loss" of containment, such that a General Emergency declaration is warranted. NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates that such conditions do not exist when the amount of clad damage is less than 20%. Hence, these radiation monitor readings correspond to 20% fuel clad damage.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4 ***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

6. Core Exit Thermocouples

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *CET > 1200°F and not restored w/i 15 min. or CET ≥ 700°F with RVLMS < 21% plenum and not restored w/i 15 min.*

LOSS: *N/A*

LOCATION: Table 1: CONTAINMENT / Row 5

TECHNICAL BASIS:

Restoration implied in the EAL assumes that function restoration procedures are considered effective if temperatures are decreasing or if vessel water level is increasing. The conditions mentioned in the EAL represent a core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with CET EALs in the Fuel Clad Barrier and leakages in the RCS Barrier, this EAL would result in the declaration of a General Emergency. There exists no success path for this event if function restoration procedures are ineffective.

Severe accident analyses *(e.g., NUREG-1150)* have concluded that function restoration procedures can arrest core degradation within the reactor vessel in a significant fraction of the core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period to allow function restoration procedures to arrest the core melt sequence. Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Operations Director/Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be, ineffective. The reactor vessel level identified in the EAL is consistent with application to PVNGS. *(See the Technical Basis for the Fuel Clad Barrier "Potential Loss" EAL on reactor vessel water level.)*

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4 ***CLASS:*** N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

3. Containment Isolation Valve Status After Containment Isolation

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Failure of both CTMT isolation valves in any one line to close and pathway to the environment exists*

LOCATION: Table 1: CONTAINMENT / Row 3

TECHNICAL BASIS:

The PVNGS setpoint for a Containment Isolation Actuation Signal *(CIAS)* is 3.0 psig containment pressure. The likely cause for elevated containment pressure is a LOCA into containment. The containment atmosphere will be contaminated to some degree by activity from the RCS. If both containment isolation valves which are required to close on a CIAS do not fully close, there will be an unmonitored release to the environment from the containment if it is determined that a downstream pathway to the environment exists. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

This EAL addresses an incomplete containment isolation that allows a direct release to the environment. It represents a loss of the Containment Barrier.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41EP-1RO02, Loss of Coolant Accident, Rev. 00.06
PVNGS Procedure 41EP-1RO08, Functional Recovery, Rev. 00.12, Appendix FA, Rev. 00.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4	*CLASS:* N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

4. SG Secondary Side Release With Primary To Secondary Leakage

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS: *N/A*

LOSS: *Release of contam. secondary side to atmosphere, i.e., S/G safety or ADV, with S/G P/S leakage > Tech Spec allowable S/G P/S leakage*

LOCATION: Table 1: CONTAINMENT / Row 4

TECHNICAL BASIS:

The "Loss" EAL is based on steam generator tube leakage in excess of Tech Spec allowable S/G primary-to-secondary leakage in combination with a release of contaminated steam to the environment. Steam release may be due to a steam line break. It may also be due to operation of the main steam safety or atmospheric dump valves *(ADVs)*, or turbine-driven AF pump exhaust. These methods may release steam to the environment as a normal factor of operation. In the case of a steam line break, the leakage to the environment may not be isolable. If the release of steam is from turbine-driven AF pump exhaust, isolation will likely result in loss of steam generator feed with eventual loss of core cooling as the steam generators boil dry. The Main Steam safety or atmospheric dump valves are commonly used as a primary means of RCS heat removal during post-trip natural circulation cooling of the core. Under these conditions, a release of steam from the Main Steam safety or atmospheric dump valves cannot be isolated without loss of core cooling or risking a possible overpressure condition in the steam generators. It is likely that there will be some contamination of the steam released to the environment by leakage from the primary coolant system. This release will be unmonitored. Without evidence of fuel or clad damage, the risk of exposure to the public exceeding FSAR limits is minimal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ08, Steam Generator Tube Leak, Rev. 00.08
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4	CLASS: N/A

CATEGORY: [F] Fission Product Barrier Degradation

NUMARC/NESP-007 INITIATING CONDITION:

8. Emergency Director Judgment

PVNGS EMERGENCY ACTION LEVEL (EAL):

POTENTIAL LOSS / LOSS: *Any condition that, in the opinion of the SM/EC, indicates loss or potential loss of CTMT Barrier*

LOCATION: Table 1: CONTAINMENT / Row 6

TECHNICAL BASIS:

This EAL addresses any other factors that are to be used by the Emergency Operations Director *(or SS/EC)* in determining whether the Containment Barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated into this EAL as a factor in Emergency Operations Director *(or SS/EC)* judgment that the barrier may be considered lost or potentially lost.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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1.5.21 2-1

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU1 Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers for greater than 15 minutes.
AND
b. At least (site-specific) emergency generators are supplying power to emergency busses.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and both Emergency Diesel Generators (EDGs) are supplying power to their respective 4.16 KV Class 1E buses

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power *(Station Blackout)*. Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

2-1

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APP MODE: **MODES 5 - 6, Defueled**

CLASS: **NUE**

CATEGORY: **[S]** System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU7 Unplanned Loss of Required DC Power During Cold Shutdown or Refueling Mode for Greater Than 15 Minutes.
1. Either of the following conditions exist:
a. Unplanned loss of Vital DC power to required DC busses based on (site-specific) bus voltage indications.
AND
b. Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:
The purpose of this EAL is to recognize a loss of DC power compromising the ability to monitor and control the removal of decay heat during Cold Shutdown or Refueling operations. This EAL is anticipatory in as much as the operating crew may not have necessary indication and control of equipment needed to respond to the loss. "Unplanned" is included in this EAL to preclude the declaration of an emergency as a result of planned maintenance activities. The intention is that the loss of the operating *(OPERABLE)* train is to be considered when the other redundant train may be out of service.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

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NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA5 AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout.
1. Either of the following conditions exist: (a and b)
a. Loss of Power to <site-specific> Transformers for Greater Than 15 Minutes, AND
b. Onsite Power Capability has been Degraded to one (Train of) Emergency Bus(ses) Powered From a Single Onsite Power Source due to the Loss of: <site-specific list>

PVNGS EMERGENCY ACTION LEVEL (EAL):

Either PBA-EI-S03 or PBB-EI-S04 indicates no voltage in Modes 1-4 under the following condition:

Loss of offsite power (ESF XFMRs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single onsite power source (EDG)
OR
Loss of onsite power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes and one 4.16 KV Class 1E bus is powered from a single offsite power source (ESF XFMR)

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

This EAL is intended to provide an escalation from EAL [SU1-1]. The condition indicated is the degradation of the offsite and onsite power systems such that any additional single failure would result in a total loss of power to both essential buses. This condition could occur due to a loss of offsite power with a concurrent failure of one emergency diesel generator to supply power to its respective emergency bus. Another related condition could be the loss of all offsite power to the essential buses from the ESF Transformers and loss of both emergency diesel generators with only one train of emergency buses being backfed from the unit main generator, or the loss of both emergency diesel generators with only one train of emergency buses being backfed from offsite power. The subsequent loss of this single power source would escalate the event to an SAE in accordance with EAL [SS1-1]. Control Room indications representing this condition would be all power supplies to both essential buses unavailable except for a single power source such that if lost, would establish the single failure vulnerability. Since PVNGS is a multi-unit site, credit is allowed for a cross-tie of another unit's emergency diesel generator, provided that the evolution is being directed by plant procedures. However, the impact of this condition on other safety functions must be considered.

2-3

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NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

This EAL does not address specific Control Room annunciator indications for this condition due to the inconsistencies associated with it. Control Room annunciation is utilized in analyzing the condition, as directed by plant annunciator response procedures which direct subsequent actions based on priorities established within those procedures.

SOURCE DOCUMENT:

41AL-1RK1A, Panel B01A Alarm Responses, Rev. 03.01
41AL-1RK1B, Panel B01B Alarm Responses, Rev. 02.08
41AL-1RK1C, Panel B01C Alarm Responses, Rev. 03.19
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: **MODES 5 - 6, Defueled** ***CLASS:*** **ALERT**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses During Cold Shutdown Or Refueling Mode.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within 15 minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 5-6 and Defueled

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. When in Cold Shutdown, Refueling, or a Defueled Mode, the event can be classified as an ALERT because of the significantly reduced decay heat, lower RCS temperature and pressure, and the increased time to restore one of the emergency buses relative to that specified for the SAE EAL. Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4 | **CLASS:** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS1 Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.
1. The following conditions exist:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency generators to supply power to emergency busses.
AND
c. Failure to restore power to at least one emergency bus within (site-specific) minutes from the time of loss of both offsite and onsite AC power.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:

Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. Prolonged loss of all AC power will cause core uncovering and loss of containment integrity. Thus, this event can escalate to a General Emergency. The fifteen minute time duration is selected to exclude transient and momentary power losses.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: MODES 1 - 4 | ***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS3 Loss of All Vital DC Power.
1. Loss of All Vital DC Power based on (site-specific) bus voltage indications for greater than 15 minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of all required 125 V Class 1E DC power (voltage < 112 as indicated on PKA-EI-M41, PKB-EI-M42, PKC-EI-M43, and/or PKD-EI-M44) for > 15 minutes in Modes 1-4

LOCATION: Table 2: ELECTRICAL / Row 2

TECHNICAL BASIS:

Loss of all DC power compromises the ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the Reactor Coolant System. Fifteen minutes is selected as a threshold to exclude transient and momentary power losses.

Bus voltage of 112 is based on minimum bus voltage necessary for the operation of safety related equipment *(i.e., 110.25 volts)*, as determined by the Engineering calculation performed to ascertain the two-hour Operability requirement with minimum bus voltage required to meet Technical Specifications OPERABILITY and by the acceptance criteria contained in 32ST-9PK03. Since instrument inaccuracy of 1% of full scale *(150)* results in an additional 1.5 volts needed to be applied, and since 1/2 of each minor division *(i.e., 2 volts)* is as close as can technically be monitored, 111.75 volts is rounded up to 112 volts as the threshold for this EAL.

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:

Engineering Calculation 13-EC-PK-161, Rev. 6
PVNGS Procedure 32MT-9ZZ09, Meter Calibration, Rev. 02.04
PVNGS Procedure 32ST-9PK03, 18 Month Surveillance Test of Station Batteries, Rev. 05.01
Combustion Engineering, Inc., Report on Combustion Engineering Input to Station Blackout Battery Evaluation for Palo Verde Units 1, 2, & 3, NOV 30, 1988
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: **MODES 1 - 4** ***CLASS:*** **GE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG1 Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power.
1. Prolonged loss of all offsite and onsite AC power as indicated by:
a. Loss of power to (site-specific) transformers.
AND
b. Failure of (site-specific) emergency diesel generators to supply power to emergency busses.
AND
c. At least one of the following conditions exist:
Restoration of at least one emergency bus within (site-specific) hours is *NOT* likely
OR
(Site-Specific) Indication of continuing degradation of core cooling based on Fission Product Barrier monitoring.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of offsite power (ESF XFMRs) and loss of onsite AC power (EDGs) to both 4.16 KV Class 1E buses PBA-S03 and PBB-S04 in Modes 1-4
AND
Power restoration to at least one 4.16 KV Class 1E bus within 4.5 hours is not likely or degradation of core cooling based on Fission Product Barrier monitoring is indicated

LOCATION: Table 2: ELECTRICAL / Row 1

TECHNICAL BASIS:
Loss of all AC power compromises all plant safety systems requiring electric power including SDC, ECCS, Containment Spray, Spent Fuel Heat Removal, and the Ultimate Heat Sink *(SP)*. Prolonged loss of all AC power will lead to loss of fuel clad, RCS, and containment. The 4.5 hour time duration to restore AC power is based on the site blackout coping analysis performed in conformance with 10 CFR 50.63 and Regulatory Guide 1.155, Station Blackout. Appropriate allowance for offsite emergency response exists. Although this EAL may be redundant to Fission Product Barrier EAL*(s)*, its inclusion is necessary to better assure timely recognition and emergency response.

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TECHNICAL BASIS (continued...):

The specification of this EAL assures that in the unlikely event of a prolonged loss of power to both essential buses, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one emergency bus is based on a realistic appraisal of the situation, since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Operations Director/Emergency Coordinator a reasonable idea of how quickly *(s)*he may need to declare a General Emergency based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is IMMINENT?

2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented?

Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Operations Director/Emergency Coordinator judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

NUMARC DEVIATION:

The EAL is not exclusive to specific transformers as the source of the loss of power, since the condition could be due to other causes. Breaker problems or relay faults would lead to the specified condition, as well. It is irrelevant what the actual cause of the condition may be. What is relevant is that the condition should be identified and actions, as a result of the loss of power, should be taken to properly classify the event and proceed under direction of plant procedures.

SOURCE DOCUMENT:

Combustion Engineering, Inc., Evaluation of a Prolonged Station Blackout with Plant Recovery, Prepared for Arizona Public Service Company, MAR 1989
Regulatory Guide 1.155, Station Blackout, AUG 1988
NUMARC 87-00, Station Blackout at Light Water Reactors
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

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APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: **[A] Abnormal Rad Levels / Radiological Effluent**

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-03 µCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

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TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-143 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{mrem}{yr}}{\left(1750\ \frac{mrem/yr}{uCi/m^3}\right)\left(8.91E\text{-}06\ \frac{sec}{m^3}\right)\left(111000\ cfm\right)\left(471.9\ \frac{cc/sec}{cfm}\right)} = 6.12E\text{-}04\ uCi/cc$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.
Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.33 3-2 (page 1 of 2)

APP MODE: **MODES 1 - 6**

CLASS: **NUE**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the "value shown" (site specific monitors) indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure): (site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 60 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration of 60 minutes or longer in excess of two times (site-specific technical specifications).

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-145 CH-1 indicating > 3.12E-03 µCi/cc sustained for 60 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

3-2

1.5.34 3-2 (page 2 of 2)

TECHNICAL BASIS (continued...):

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the RU-145 HI Alarm setpoint, which correlates to the ODCM limit for offsite dose:

$$\frac{500\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(43500\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.56\text{E-03 uCi / cc}$$

Where: 500 = Total Body Dose Rate Limit in mrem/yr
43500 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per μCi/m^3 using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.35 3-3 (page 1 of 2)

APP MODE: MODES 1 - 6 — ***CLASS:*** NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 2 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The term "Unplanned", as used in this context, includes any release for which a radioactive discharge permit was not prepared, or a release that exceeds the conditions *(e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.)* on the applicable permit.

Unplanned releases in excess of two times the site Offsite Dose Calculation Manual *(ODCM)* that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose *(which is very low in the NUE Classification)* is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. Therefore, it is not intended that the release be averaged over 60 minutes. For example, a release of 4 times the ODCM for 30 minutes does not exceed this EAL. Further, the Emergency Coordinator should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes.

10 CFR 50.72 requires a non-emergency four-hour report for a release that exceeds 2 times maximum permissible concentrations *(MPC)* in unrestricted areas averaged over a period of one hour. There is generally more than one applicable ODCM limit *(e.g., air dose rate, organ dose rate, organ doses, release rates, etc.)*. Often, effluent monitor alarms are based on instantaneous release rates. Depending on the source term, other ODCM limits may impose more restrictions. For this reason, the EALs should trigger an assessment of all applicable ODCM limits.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements. Annual average meteorological criteria is also used where allowed.

3-3

1.5.36 3-3 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.37 3-4

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Technical Specifications for 60 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (site-specific value) for 60 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 0.1 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 0.1 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into a Notification of Unusual Event *(NUE).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-4

1.5.38 3-5

APP MODE: MODES 1 - 6	CLASS: NUE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
4. Valid Direct Area Radiation Monitor readings increases by a factor of 1000 over normal * levels.
* Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unexpected increase by a factor of 1000 over normal levels in valid direct area radiation monitor readings within the unit

(normal levels comprise the highest reading in the past 24 hours excluding the current peak value)

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses unplanned increases in in-plant radiation levels that represent a degradation in the control of radioactive material, and represent a potential degradation in the level of safety of the plant. Possible events which could lead to loss of control of radioactive material of this magnitude include, but are not limited to:

w Spent resin transfer with a resin spill or resin hose break
w Waste Gas Decay Tank leak or rupture

If the increases impair safe plant operations, then this EAL escalates to an ALERT.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-5

1.5.39 3-6

APP MODE: **MODES 1 - 6** | ***CLASS:*** **NUE**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AU2 Unexpected increase in Plant Radiation or Airborne Concentration.
1. (Site-Specific) indication of uncontrolled water level decrease in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water.
2. Uncontrolled water level decrease in the spent fuel pool and fuel transfer canal with all irradiated fuel assemblies remaining covered by water.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Uncontrolled water level decrease (as indicated by associated level alarms, sumps, or by visual indication) in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal with all irradiated fuel assemblies remaining covered by water

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

These events tend to have long lead times relative to potential for radiological release outside the Site Boundary. Thus, impact to public health and safety is very low.

In light of reactor cavity seal failure incidents at two different PWRs and loss of water in the spent fuel pool/fuel transfer canal at a BWR, all occurring since 1984, explicit coverage of these types of events is appropriate, given their potential for increased doses to plant staff. Classification as an NUE is warranted as a precursor to a more serious event.

NUMARC DEVIATION:

Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, Abnormal Rad Levels / Radiological Effluent, Question #13, the inclusion of "airborne concentration" in AU2 is an error and should be disregarded. Hence, no mention of "airborne concentration" exists in this EAL.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

3-6

1.5.40 3-7

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU4 Fuel Clad Degradation.
2. (Site-Specific) coolant sample activity value indicating fuel clad degradation greater than Technical Specification allowable limits.

PVNGS EMERGENCY ACTION LEVEL (EAL):

RCS specific activity > Technical Specification allowable limits

LOCATION: Table 3: RADIOLOGICAL / Row 7

TECHNICAL BASIS:

This EAL is considered to reflect a potential degradation in the level of safety of the plant and a potential precursor to more serious problems. The Technical Specification limit is set to ensure that following a steam generator tube rupture accident in conjunction with an assumed steady state steam generator leak rate of 1 gpm and a concurrent loss of offsite electrical power, the 2-hour dose rate to the public will not exceed ODCM limits for exposure to the public. The action required is a plant shutdown with T_C < 500°F within 6 hours for activity exceeding 100/E-Bar. With the specific activity of the coolant exceeding 1.0 µCi/gm Dose Equivalent I^{131} for more than 48 hours during one continuous time interval, or exceeding a limit line specified in Technical Specifications Figure 3.4-1, the action required is plant shutdown with T_C < 500°F within 6 hours. The permission to operate for a limited period of time with the primary coolant activity greater than 1.0 µCi/gm, but below the curve in Technical Specification Figure 3.4-1, accommodates possible iodine spiking which may accompany changes in reactor thermal power.

NUMARC DEVIATION:

NONE. PVNGS Technical Specifications depicts values associated with RCS specific activity.

SOURCE DOCUMENT:

Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-7

1.5.41 3-8 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-143 CH-1 indicating > 1.22E-02 µCi/cc sustained for 15 minutes or longer
OR
Valid
dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-8

1.5.42 3-8 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Plant Vent reading, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000 \frac{\text{mrem}}{\text{yr}}}{\left(1750 \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right) \left(8.91\text{E-06} \frac{\text{sec}}{\text{m}^3}\right) \left(111000 \text{ cfm}\right) \left(471.9 \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.22\text{E-02 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
111000 = Maximum process flow for the Plant Vent in CFM w/o Refueling Purge
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.43 3-9 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
1. A valid reading on one or more of the following monitors that exceeds the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
NOTE: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.
2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates in excess of (200 x site-specific technical specifications) for 15 minutes or longer.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.13E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 10000 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be made based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 10. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

3-9

1.5.44 3-9 (page 2 of 2)

TECHNICAL BASIS (continued...):

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20 and by a factor which is the ratio of the normal process flowrate to the Essential ventilation process flowrate for the Fuel Building Exhaust. Annual average meteorological criteria is also used where allowed.

The following calculation is used to derive the EAL for an ALERT on the Fuel Bldg. Exhaust, which correlates to 20 times the ODCM limit for offsite dose:

$$\frac{10000\ \frac{\text{mrem}}{\text{yr}}}{\left(1750\ \frac{\text{mrem / yr}}{\text{uCi / m}^3}\right)\left(8.91\text{E-06}\ \frac{\text{sec}}{\text{m}^3}\right)\left(12000\ \text{cfm}\right)\left(471.9\ \frac{\text{cc / sec}}{\text{cfm}}\right)} = 1.13\text{E-01 uCi / cc}$$

Where: 10000 = 20 times the Total Body Dose Rate Limit of 500 in mrem/yr
12000 = Maximum process flow for the Fuel Bldg. in CFM
1750 = Equivalent Total Body Dose in mrem/yr per $\mu Ci/m^3$ using 1% failed fuel mix
8.91E-06 = Highest annual c/Q in sec/m^3 from the ODCM
471.9 = A units conversion factor in cc/sec per CFM

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.45 3-10 (page 1 of 2).

APP MODE: **MODES 1 - 6** | ***CLASS:*** **ALERT**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned radioactivity release which results in Site Boundary Dose Rates > 20 x ODCM Section 3.0, 4.0, and 5.0 limits as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

This event escalates from the NUE by escalating the magnitude of the release by a factor of 20. Prorating the 500 mrem/yr criterion for both time *(8760 hr/yr)* and the 20 multiplier, the associated Site Boundary Dose Rate would be 1.0 mrem/hr. The required release duration was reduced to 15 minutes in recognition of the increased severity.

Monitor indications are calculated on the basis of the methodology of the ODCM and other procedures which are used to demonstrate compliance with 10 CFR 20 and/or 10 CFR 50 Appendix I requirements -- adjusted upwards by a factor of 20. Annual average meteorological criteria is also used where allowed.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3).*

3-10

1.5.46 3-10 (page 2 of 2)

NUMARC DEVIATION (continued...):

In lieu of specific dose rate values, reference to the Offsite Dose Calculation Manual *(ODCM)* is included as part of the EAL due to the magnitude of entries and their respective bases within the ODCM.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.47 3-11

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times Radiological Technical Specifications for 15 Minutes or Longer.
4. Valid indication on automatic real-time dose assessment capability greater than (200 x site-specific Technical Specifications value) for 15 minutes or longer [for sites having such capability].

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1.0 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

LOCATION: Table 3: RADIOLOGICAL / Row 4

TECHNICAL BASIS:

A measured dose rate of 1.0 mrem/hr Deep Dose Equivalent at the Site Boundary indicates entry into an ALERT.

NUMARC DEVIATION:

Since a NUMARC/NESP-007 referenced multiplier of 200 yields a value approaching the Site Area Emergency threshold calculated per the EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, a multiplier of 20 is selected to allow a configuration representing a valid, incremental escalation from NUE to ALERT, and from ALERT to SAE.

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

Liquid releases are not addressed in the EAL as PVNGS is a "dry" site comprising no liquid releases offsite *(RE: PVNGS UFSAR Section 11.2.3)*.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

3-11

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APP MODE: **MODES 1 - 6** ***CLASS:*** **ALERT**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA3 Release of Radioactive Material or Increases in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown
1. Valid (site-specific) radiation monitor readings GREATER THAN 15 mR/hr in areas requiring continuous occupancy to maintain plant safety functions:
- (Site-specific) list
2. Valid (site-specific) radiation monitor readings GREATER THAN <site specific> values in areas requiring infrequent access to maintain plant safety functions.
- (Site-specific) list
NOTE: The Emergency Director should determine the cause of the increase in radiation levels and review other ICs for applicability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid readings on the associated radiation monitor in any of the following areas required to maintain plant safety functions which are:

(1) > 15 mR/hr:
- RU-18 Control Room
- RU-18 Secondary Alarm Station

OR

(2) > 5000 mR/hr:
- RU-18 Remote Shutdown Panels
- RU-155 Main Steam Support Structure
- RU-153c Aux Bldg, 100' East
- RU-23 Chemistry Hot Laboratory
- RU-19 Fuel Building

LOCATION: Table 3: RADIOLOGICAL / Row 5

TECHNICAL BASIS:

This EAL addresses increased radiation levels that impede necessary access to operating stations, or other areas containing equipment which must be operated manually, in order to maintain safe operation or perform a safe shutdown. It is this impaired ability to operate the plant that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the increase inradiation levels is not a concern of this EAL. The Emergency Coordinator must consider the source or cause of the increased radiation levels and determine if any other EAL may be involved. For example, a dose rate of 15 mrem/hr in the Control Room may be a problem in itself. However, the increase may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, an SAE or GE may be indicated by the fission product barrier matrix EALs.

3-12

1.5.49 3-12 (page 2 of 2)

TECHNICAL BASIS (continued...):

At PVNGS, this EAL could result in a declaration of an ALERT at one unit due to a radioactivity release or radiation shine resulting from a major accident at another unit. This is appropriate if the increase impairs operations at the operating unit.

This EAL is not meant to apply to increases in the containment dome radiation monitors (*RU-148 and/or RU-149)*, as these are events which are addressed in the Fission Product Barrier Reference EALs. Nor is it intended to apply to anticipated temporary increases due to planned events *(e.g., incore detector move-ment, radwaste container movement, depleted resin transfers, etc.).*

Areas requiring continuous occupancy include the Control Room and the Secondary Alarm Station. The Radwaste Control Room is not determined to require continuous occupancy because radwaste systems are not in use following accident situations where dose rates may escalate beyond normal levels per the SER, Chapter 22, 11.B.2. The value of 15 mrem/hr is derived from the General Design Criteria-19 *(GDC-19)* value of 5 rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, Clarification of TMI Action Plan Requirements, provides that the 15 mrem/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30-day duration implies an event potentially more significant than an ALERT.

Areas requiring infrequent access are those which house equipment that do/may require manual operation to maintain safe plant operations or perform a safe plant shutdown. The Remote Shutdown Panels Area must be manned under adverse Control Room conditions and is required for plant shutdown. The other areas listed in the EAL are those identified in the Unit 3 PASS Licensing Checklist and comprises areas needed for access by plant personnel under adverse radiological conditions to perform manual operations required by plant operating procedures. For areas requiring infrequent access, the 5000 mrem/hr value is based on radiation levels which result in exposure control measures intended to maintain doses within normal occupational exposure guidelines and limits *(i.e., 10 CFR 20)*, and in doing so, will impede necessary access.

The radiation monitors associated with this EAL read in Roentgen and mR, rather than rem and mrem. Surveys of areas requiring access are recorded in mrem. For nuclear power plant gamma rays *(excluding N-16)*, mrem and mR are approximately equal.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix-R Operational Considerations, 29 JUL 93
ANPP Post-Accident Sampling System Licensing Technical Review Response Justification, 09 AUG 85
Engineering Calculation 03-NC-SS-A01, Post-Accident Doses, 28 JUN 87
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUREG-0857, Safety Evaluation Report Related to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2, and 3, NOV 81
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2a

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APP MODE: **MODES 1 - 6** | ***CLASS:*** **ALERT**

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AA2 Major Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.

1. A (site-specific setpoint) alarm on one or more of the following radiation monitors: (site-specific monitors)
Refuel Floor Area Radiation Monitor
Fuel Handling Building Ventilation Monitor
Fuel Bridge Area Radiation Monitor
2. Report of visual observation of irradiated fuel uncovered.
3. Water level less than (site-specific) feet for the Reactor Refueling Cavity that will result in Irradiated Fuel Uncovering.
4. Water level less than (site-specific) feet for the Spent Fuel Pool and Fuel Transfer Canal that will result in Irradiated Fuel uncovering.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Major damage to irradiated fuel or indication of loss of water level in the reactor refueling cavity, spent fuel pool, and/or fuel transfer canal (i.e., level < 132.5 ft. elevation as indicated by associated level alarms, sumps, or by visual indication) such that the uncovering of irradiated fuel (outside the reactor vessel) has or will occur

AND

Valid high radiation alarm on the associated radiation monitor exists: RU-16, RU-31, RU-33, RU-143, or RU-145

LOCATION: Table 3: RADIOLOGICAL / Row 6

TECHNICAL BASIS:

This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage, which is not applicable to PVNGS. NUREG-0818, Emergency Action Levels for Light Water Reactors, forms the basis for these EALs.

There is time available to take corrective actions, and there is little potential for substantial fuel damage. In addition, NUREG/CR-4982, Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82, July 1987, indicates that even if corrective actions are not taken, no prompt fatalities are predicted, and that risk of injury is low. In addition, NRC Information Notice No. 90-08, KR-85 Hazards from Decayed Fuel, presents the following in its discussion:

3-13

1.5.51 3-13 (page 2 of 2)

TECHNICAL BASIS (continued...):

In the event of a serious accident involving decayed spent fuel, protective actions would be needed for personnel on site, while offsite doses *(assuming an exclusion area radius of one mile from the plant site)* would be well below the Environmental Protection Agency's Protective Action Guides. Accordingly, it is important to be able to properly survey and monitor for Kr-85 in the event of an accident with decayed spent fuel.

Licensees may wish to reevaluate whether Emergency Action Levels specified in the emergency plan and procedures governing decayed fuel-handling activities appropriately focus on concern for onsite workers and Kr-85 releases in areas where decayed spent fuel accidents could occur, for example, the spent fuel pool working floor. Furthermore, licensees may wish to determine if emergency plans and corresponding implementing procedures address the means for limiting radiological exposures of onsite personnel who are in other areas of the plant. Among other things, moving onsite personnel away from the plume and shutting off building air intakes downwind from the source may be appropriate.

The 132.5 ft. elevation *(17.5 ft. above the fuel)* is based on a level corresponding to a point below which siphoning of water in the Spent Fuel Pool would cease. Any further uncontrolled water level decrease beyond this point would indicate major problems with sealing areas, signifying a potential radiation dose consequence to plant personnel.

Thus, an ALERT Classification for this event is appropriate. Escalation, if appropriate, would occur via the Radiological Category or the Emergency Coordinator judgment.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

Regulatory Guide 1.25, Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors, Rev. 0, 23 MAR 72
Combustion Engineering Standard Safety Analysis Report *(CESSAR)*, Section 9.1.4.6
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
Bechtel Calculation 13-NC-ZY-203, Fuel Handling Accident in the Fuel Building, Rev. 4
Combustion Engineering Study 14273-RCE-404, Implications of Cavity Seal Failure, Rev. 0
INPO SOER 85-01, Reactor Cavity Seal Failure
PVNGS Procedure 41AL-1PC01, Fuel Pool Cooling and Cleanup System Local Alarm Panel 1-J-PCN-E02 Responses, Rev. 03.03
PVNGS Procedure 41AO-1ZZ26, Irradiated Fuel Damage, Rev. 03.01
PVNGS Procedure 41AO-1ZZ53, Loss of Refueling Pool and/or Spent Fuel Pool Level, Rev. 02.06
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.52 3-14 (page 1 of 2)

APP MODE: MODES 1 - 6 ***CLASS:*** SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E-01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE,

3-14

1.5.53 3-14 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.54 3-15 (page 1 of 2)

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-1 indicating > 1.96E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 100 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+06 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE,

3-15

1.5.55 3-15 (page 2 of 2)

TECHNICAL BASIS (continued...):

whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0..

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.56 3-16 (page 1 of 2)

APP MODE: **MODES 1 - 6** ***CLASS:*** **SAE**

CATEGORY: **[A]** Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AS1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR Whole Body or 500 mR Child Thyroid for the Actual or Projected Duration of the Release.

3. Valid dose assessment capability indicates dose consequences greater than 100 mR whole body or 500 mR child thyroid.

4. Field survey results indicate site boundary dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 500 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 100 mrem/hr Deep Dose Equivalent as measured with portable instrumentation

OR

Valid dose assessment indicates > 100 mrem/hr TEDE or > 500 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 100 mrem integrated Total Effective Dose Equivalent *(TEDE)* in this EAL is based on the 10 CFR 20 annual member-of-the-public exposure limit. This value also provides a desirable gradient *(one order of magnitude)* between the ALERT, SAE, and GE Classes. It is deemed that exposures less than this limit are not consistent with the SAE Class description. The 500 mrem integrated thyroid Committed Dose Equivalent *(CDE)* was established in consideration of the 1:5 ratio of the EPA Protective Action Guidelines for TEDE and thyroid CDE.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on a calculated Site Boundary Dose Rate of 100 mrem/hr TEDE or 500 mrem/hr thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1)*, a General Emergency EAL. This Site Area Emergency EAL is proportioned to 10% of EAL V-72 for the same vent pathway and directly correlates to established generic guidance.

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1.5.57 3-16 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.58 3-17 (page 1 of 7)

APP MODE: MODES 1 - 6 ***CLASS:*** GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Plant Vent sample analysis or valid reading on Plant Vent RU-144 CH-1 indicating > 2.20E+00 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 1

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem Total Effective Dose Equivalent or 5 rem thyroid Committed Dose Equivalent. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-17

1.5.59 3-17 (page 2 of 7) .

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The following calculation demonstrates that EALs of 2.2 µCi/cc on the Plant Vent monitor and 19.6 µCi/cc on the Fuel Building Vent monitor will produce, for a 1-hour exposure, EPA-400 PAG values of *(a)* 1 rem TEDE at the Site Boundary, or *(b)* 5 rem thyroid CDE, without exceeding the other EPA-400 PAG value. Under NUMARC/NESP-007, these values will be used as EALs for General Emergency. The corresponding EAL values for Site Area Emergency are 10% of the General Emergency values.

For the Fuel Building Vent monitor, a reading of 1.56E-03 µCi/cc or greater will cause an automatic reduction in flow rate of 43,500 cfm to a design value of 12,000 cfm *(provided both trains of essential ventilation are in operation)*. This concentration is one-half the EAL for Unusual Event. Therefore, a flow rate of 12,000 cfm will be used for this calculation. Bringing essential ventilation online also results in charcoal filtration of the Fuel Building Vent effluent, which consists of the ventilation exhausts from the Fuel Building as well as the Auxiliary Building below ground level. This filtration results in an Iodine reduction factor of 20, that is, a charcoal filter efficiency of 95%.

The design maximum flow rate for the Plant Vent is 111,000 cfm without the refueling purge in operation. Radiation Monitoring System *(RMS)* alarm setpoints do not reduce flow rate to the Plant Vent. Charcoal filtration is brought online through operator actions for the several flows to the Plant Vent which have a potential Iodine source term. This action provides an Iodine reduction factor of 20. RMS alarm setpoints and the EALs stated as concentrations in the Plant Vent exhaust and the Fuel Building Vent exhaust are based on noble gas concentration.

Based on the foregoing, the methodology of this calculation will be to calculate TEDE and thyroid CDE at the Site Boundary for a one-hour release with a default atmospheric dispersion coefficient *($c/Q = 8.91E{-}06\ sec/m^3$)*, which is the highest sector annual average c/Q value from the ODCM. The calculation for the Plant Vent release uses 2.2 µCi/cc noble gas for the accident type with the highest Iodine/noble gas *(I/NG)* ratio and 95% filter efficiency for Iodine. This process would then be repeated for releases from the Fuel Building Vent at 1.96E+01 µCi/cc.

1.5.60 3-17 (page 3 of 7)

TECHNICAL BASIS (continued...):

The Iodine/noble gas *(I/NG)* ratios at time = zero effective age are obtained from MESOREM, Jr.:

Plant Vent Releases I/NG

1. Isolated Containment *(100% LOCA / with iodine filtered)* 1.9E-02
2. Steam Generator Tube Rupture with 1% Failed Fuel 7.5E-05
3. Steam Generator Tube Rupture with 100% Failed Fuel 5.1E-04
4. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
5. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
6. Waste Gas Decay Tank Rupture 0
7. Fuel Handling Accident 2.5E-04

Fuel Building Vent Releases I/NG

1. Loss of Coolant Accident with 1% Failed Fuel 3.8E-03
2. Loss of Coolant Accident with 100% Failed Fuel 2.2E-02
3. Fuel Handling Accident 2.5E-04

For both vent pathways, the Loss of Coolant Accident *(LOCA)* with 100% Failed Fuel has the highest I/NG ratio *(maximum thyroid CDE)*. Noble gas release rate is fixed at the RMS reading specified *(Plant Vent = 2.2 µCi/cc, Fuel.Building Vent = 19.6 µCi/cc)* multiplied by the process flow rate *(Plant Vent = 111,000 cfm, Fuel Building Vent = 12,000 cfm)*. The source term, in units of µCi/sec., is the same for both vent pathways, given these flow rates, concentrations, and this accident type *(i.e., 19.6/2.2 = 111,000/12,000)*.

Use of the LOCA with 100% Failed Fuel is consistent with PVNGS UFSAR Section 1.8, "Regulatory Guide 1.52 Response", in which this accident type is postulated for the design basis of the Control Building Essential Ventilation System. The same UFSAR Section also postulates the Fuel Handling Accident for the design basis of the Fuel Building Essential Ventilation System. By inspection of the above table, it can be seen that the Fuel Handling Accident has a lower I/NG ratio than the LOCA with 100% Failed Fuel. Therefore, given that the same accident type is limiting for both vent pathways, it is not necessary to calculate doses from both vents; they would be the same.

The source term or release rate is calculated in the following table per the equation:

Ci/sec = (µCi/cc) (ft^3/min) (472 cc/sec per ft^3/min) (1E-06 Ci/µCi)
= (µCi/cc) (1.07E+05) (472) (1E-06)
= (µCi/cc) (50.5)

1.5.61 3-17 (page 4 of 7)

TECHNICAL BASIS (continued...):

The isotopic mix at time = zero effective age is obtained from MESOREM, Jr.:

Nuclide	100% LOCA mix *(%)*	Source Term (μCi/cc)	Release Rate (Ci/sec.)
I-131	12.1	6.0E-03	3.0E-01
I-132	12.4	6.0E-03	3.0E-01
I-133	24.8	1.2E-02	6.1E-01
I-134	27.1	1.3E-02	6.6E-01
I-135	23.6	1.1E-02	5.6E-01
Total Iodine	100.0	4.8E-02 *	2.4E+00
Kr-83m	0.0	0	0
Kr-85m	3.3	7.5E-02	3.8E+00
Kr-85	0.1	2.2E-03	1.1E-01
Kr-87	5.6	1.3E-01	6.6E+00
Kr-88	8.2	1.8E-01	9.1E+00
Kr-89	10.3	2.2E-01	1.1E+01
Xe-131m	0.1	2.2E-03	1.1E-01
Xe-133m	0.0	0	0
Xe-133	21.6	4.8E-01	2.4E+01
Xe-135m	6.1	1.4E-01	7.1E+00
Xe-135	5.1	1.1E-01	5.6E+00
Xe-137	20.0	4.4E-01	2.2E+01
Xe-138	19.6	4.3E-01	2.2E+01
Total NG	100.0	2.2E+00	1.1E+02

* Based on the I/NG ratio of 2.2E-02 and NG concentration of 2.2 μCi/cc

$CEDE_{inhalation} = \hat{A}_{i=1\ to\ n}\ (DCF)_i\ (c/Q)\ (Release\ Rate)_i\ (Unit\ Conversion)$

where:

DCF_i = Dose Conversion Factor from EPA-400, Table 5-4, for nuclide "i", in rem-cc per μCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(Release\ Rate)_i$ is as was just calculated, in Ci/second

(Unit Conversion) = 1 μCi/cc per Ci/m^3

1.5.62 3-17 (page 5 of 7)

TECHNICAL BASIS (continued...):

Nuclide	DCF_i	c/Q	Release Rate	$CEDE_i$
I-131	3.9E+04	8.91E-06	3.0E-01	1.0E-01
I-132	4.6E+02	8.91E-06	3.0E-01	1.3E-03
I-133	7.0E+03	8.91E-06	6.1E-01	3.8E-02
I-134	1.6E+02	8.91E-06	6.6E-01	9.4E-04
I-135	1.5E+03	8.91E-06	5.6E-01	7.5E-03
Noble Gases	0	8.91E-06	as given	0

$CEDE_{Inhalation}$ = 1.5E-01 rem/hour

External EDE = $\hat{A}_{i=1 \text{ to } n}$ $(DCF)_i$ (c/Q) (Release Rate)$_i$ (Unit Conversion)

where:

DCF_i= Dose Conversion Factor from EPA-400, Table 5-3, for nuclide "i", in rem-cc per mCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

(Release Rate)$_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 μCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	External EDE_i
I-131	2.2E+02	8.91E-06	3.0E-01	5.9E-04
I-132	1.4E+03	8.91E-06	3.0E-01	3.7E-03
I-133	3.5E+02	8.91E-06	6.1E-01	1.9E-03
I-134	1.6E+03	8.91E-06	6.6E-01	9.4E-03
I-135	9.5E+02	8.91E-06	5.6E-01	4.7E-03
Kr-83m	0	8.91E-06	0	0
Kr-85m	9.3E+01	8.91E-06	3.8E+00	3.1E-03
Kr-85	1.3E+00	8.91E-06	1.1E-01	1.3E-06
Kr-87	5.1E+02	8.91E-06	6.6E+00	3.0E-02
Kr-88	1.3E+03	8.91E-06	9.1E+00	1.1E-01
Kr-89	1.2E+03	8.91E-06	1.1E+01	1.2E-01
Xe-131m	4.9E+00	8.91E-06	1.1E-01	4.8E-06
Xe-133m	1.7E+01	8.91E-06	0	0
Xe-133	2.0E+01	8.91E-06	2.4E+01	4.3E-03
Xe-135m	2.5E+02	8.91E-06	7.1E+00	1.6E-02
Xe-135	1.4E+02	8.91E-06	5.6E+00	7.0E-03
Xe-137	1.1E+02	8.91E-06	2.2E+01	2.2E-02
Xe-138	7.1E+02	8.91E-06	2.2E+01	1.4E-01

External EDE = 4.7E-01 rem/hour

1.5.63 3-17 (page 6 of 7)

TECHNICAL BASIS (continued...):

A "depleted c/Q" could be used for the Iodine Isotopes; the resulting reduction in external EDE would be small.

In MESOREM Jr. Mode-A dose projections, CEDE is from inhalation only and external EDE is from immersion only; that is, CEDE from ingestion is calculated only in Mode-B, and external EDE from deposition is used only in PAG calculations and not EAL calculations. Particulate source term is also reserved for Mode-B projections. Therefore, for purposes of Initial Phase EALs:

$TEDE = CEDE_{inhalation} + \text{External EDE}$

$= 1.5E\text{-}01 + 4.7E\text{-}01$

$= 6.2E\text{-}01$ rem/hour

Conclusion 1:

Based on a Plant Vent concentration (noble gas) of 2.2 µCi/cc or a Fuel Building Vent concentration of 19.6 µCi/cc, the TEDE PAG is not reached for the postulated accident type.

The thyroid CDE will now be calculated for a Plant Vent concentration (noble gas) of 2.2 µCi/cc to show whether this proposed EAL value reaches or exceeds the thyroid CDE PAG.

$CDE = \hat{A}_{i=1 \text{ to } n} (DCF)_i \, (c/Q) \, (\text{Release Rate})_i \, (\text{Unit Conversion})$

where:

DCF_i= Dose Conversion Factor from EPA-400, Tables 5-2 and 5-4, for nuclide "i", in rem-cc per µCi-hour

c/Q = 8.91E-06 seconds/meter^3, as discussed previously

$(\text{Release Rate})_i$ is as calculated above, in Ci/second

(Unit Conversion) = 1 µCi/cc per Ci/m^3

Nuclide	DCF_i	c/Q	Release Rate	Thyroid CDE_i
I-131	1.3E+06	8.91E-06	3.0E-01	3.5E+00
I-132	7.7E+03	8.91E-06	3.0E-01	2.0E-02
I-133	2.2E+05	8.91E-06	6.1E-01	1.2E+00
I-134	1.3E+03	8.91E-06	6.6E-01	7.6E-03
I-135	3.8E+04	8.91E-06	5.6E-01	1.9E-01

Thyroid CDE = 4.9 rem/hour

1.5.64 3-17 (page 7 of 7)

TECHNICAL BASIS (continued...):

Conclusion 2:

Based on a Plant Vent concentration (noble gas) of 2.2 µCi/cc or a Fuel Building Vent concentration of 19.6 µCi/cc, the Thyroid CDE PAG is reached (a Plant Vent concentration of 2.3 µCi/cc would give a result slightly over 5.0 rem/hour) for the postulated accident type.

NOTE: External EDE rate, TEDE rate, and thyroid CDE rate are calculated using MESOREM, Jr. Total Body Dose rate is calculated using methodology in PVNGS Procedure 74RM-9EF41.

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
MESOREM, Jr., Atmospheric Dispersion and Dose Assessment Program, Ver. 0165-4.02
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.65 3-18 (page 1 of 2)

APP MODE: MODES 1 - 6 | *CLASS:* GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
1. A valid reading on one or more of the following monitors that exceeds or is expected to exceed the value shown indicates that the release may have exceeded the above criterion and indicates the need to assess the release with (site-specific procedure):
(site-specific list)
Note: If the monitor reading(s) is sustained for longer than 15 minutes and the required assessments cannot be completed within this period, then the declaration must be made based on the valid reading.

PVNGS EMERGENCY ACTION LEVEL (EAL):

* Per 74RM-9EF41:
Confirmed Fuel Bldg. sample analysis or valid reading on Fuel Bldg. RU-146 CH-2 indicating > 1.96E+01 µCi/cc sustained for 15 minutes or longer
OR
Valid dose assessment indicates > 1000 mrem/hr external EDE at the Site Boundary
OR
Valid dose assessment indicates > 1.00E+07 mrem/year Total Body Dose at the Site Boundary

* If the monitor reading is sustained for longer than the time frame specified and required assessments cannot be completed within this period, then the declaration must be based on the valid reading

LOCATION: Table 3: RADIOLOGICAL / Row 2

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

3-18

1.5.66 3-18 (page 2 of 2).

TECHNICAL BASIS (continued...):

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1).*

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.67 3-19 (page 1 of 2)

APP MODE: MODES 1 - 6	***CLASS:*** GE

CATEGORY: [A] Abnormal Rad Levels / Radiological Effluent

NUMARC/NESP-007 INITIATING CONDITION:

AG1 Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR Whole Body or 5000 mR Child Thyroid for the Actual or Projected Duration of the Release Using Actual Meteorology.
3. Valid dose assessment capability indicates dose consequences greater than 1000 mR whole body or 5000 mR child thyroid.
4. Field survey results indicate site boundary dose rates exceeding 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid dose commitment of 5000 mR for one hour of inhalation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Site Boundary Dose Rate > 1000 mrem/hr Deep Dose Equivalent as measured with portable instrumentation
OR
Valid dose assessment indicates > 1000 mrem/hr TEDE or > 5000 mrem/hr thyroid CDE at the Site Boundary

LOCATION: Table 3: RADIOLOGICAL / Row 3

TECHNICAL BASIS:

The 1000 mrem Total Effective Dose Equivalent *(TEDE)* and the 5000 mrem thyroid Committed Dose Equivalent *(CDE)* are based on the EPA protective action guidance which indicates that public protective actions are indicated if the dose exceeds 1 rem TEDE or 5 rem thyroid CDE. This is consistent with the emergency class description for a General Emergency. This level constitutes the upper level of the desirable gradient for the Site Area Emergency. Actual meteorology is specifically identified in the EAL since it gives the most accurate dose assessment. Actual meteorology *(including forecasts)* should be used whenever possible.

Integrated doses are generally not monitored in real-time. In this EAL, a duration of one hour is assumed and is based on calculated Site Boundary Doses for TEDE or thyroid CDE, whichever is more limiting, depending on source term assumptions.

The FSAR source terms applicable to each monitored pathway are used in conjunction with annual average meteorology in determining indications for the monitors on that pathway. The calculation is shown in the Technical Basis for EAL V-72 *(NUMARC EAL AG1-1).*

3-19

1.5.68 3-19 (page 2 of 2)

NUMARC DEVIATION:

Due to NRC Generic Letter 89-01, PVNGS has transferred its Radiological Technical Specifications *(Section 3/4.11)* to the Offsite Dose Calculation Manual, Sections 3.0, 4.0, and 5.0.

The radiation quantities "Whole Body" and "Child Thyroid" were supplanted by "TEDE" and "Thyroid CDE" in accordance with EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

The NUMARC Final Industry Paper on "Implementation of the New EPA Protective Action Guides in Existing Emergency Programs", 13 APR 93, Implementation Suggestion #2, advises utilities to base thyroid calculations on the adult age group, as specified by the EPA, provided that this is consistent with the age group used by the offsite agencies in their EPZs. The State of AZ offsite agencies have elected not to retain the child age group and will utilize the adult age group for thyroid calculations.

PVNGS has committed in its Emergency Plan to specify into its EALs appropriate Site Boundary Dose Rates as measured with portable instrumentation. No automatic real-time instrumentation exists at the Site Boundary.

SOURCE DOCUMENT:

PVNGS Procedure 74RM-9EF41, Radiation Monitoring System Alarm Response, Rev. 4
PVNGS Procedure 74RM-9EF42, Radiation Monitor Alarm Setpoint Determination, Rev. 2
File 93-127-419, RMS Effluent Monitor Setpoint Calculations for 1993
PVNGS Commitment RCTS 033715
Offsite Dose Calculation Manual *(ODCM)*, Rev. 7
EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
PVNGS Emergency Plan, Rev. 14
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.69 4-1

APP MODE: MODES 1 - 4 — *CLASS:* NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU5 RCS Leakage.
1. The following conditions exist:
a. Unidentified or pressure boundary leakage greater than 10 gpm.
OR
b. Identified leakage greater than 25 gpm.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unidentified or pressure boundary leakage > 10 gpm in Modes 1-4

Identified leakage > 25 gpm in Modes 1-4

LOCATION: Table 4: LEAKAGE / Row 1, Row 2

TECHNICAL BASIS:

This EAL is included as an NUE because it may be a precursor to more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified or pressure boundary leakage is selected as it is observable with normal Control Room indications. Lesser values must generally be determined through time-consuming surveillance tests *(e.g., mass balances)*. The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. Either value exceeded requires immediate classification *(i.e., Tech Spec LCO allowable Action Statement time limits are not applicable).*

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

4-1

1.5.70 5-1 (page 1 of 2)

APP MODE: MODES 1 - 4 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU3 Unplanned Loss of Most or All Safety System Annunciation or Indication in The Control Room for Greater Than 15 Minutes

1. The following conditions exist:

a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.

AND

b. Compensatory non-alarming indications are available.

AND

c. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).

AND

d. Annunciator or indicator loss does not result from planned action.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and compensatory indications are available

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This and other related EALs are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.).*

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities. "Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-1

1.5.71 5-1 (page 2 of 2)

TECHNICAL BASIS (continued...):

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

Fifteen minutes is selected as a threshold to exclude transient or momentary power losses.

This EAL applies to Operating Modes 1-4 only, due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.72 5-2

APP MODE: MODES 1 - 4 ***CLASS:*** NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU2 Inability to Reach Required Shutdown Within Technical Specification Limits.
1. Plant is not brought to required operating mode within (site-specific) Technical Specifications LCO Action Statement Time.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Inability to reach required shutdown conditions within the Tech Spec LCO allowable Action Statement time limits while in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Limiting Conditions of Operation *(LCOs)* require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by PVNGS Technical Specifications requires a one-hour report under 10 CFR 50.72*(b)*, Non-emergency events. The plant is within its safety envelope when being shut down within the allowable LCO Action Statement time limits in the Technical Specifications. An immediate Notification of Unusual Event is required when the plant is not brought to the required operating mode within the allowable LCO Action Statement time limits in the Technical Specifications. Declaration of an NUE is based on the time at which the LCO-specified Action Statement time period elapses under the PVNGS Technical Specifications and is not related to how long a condition may have existed. Other required Technical Specification shutdowns that involve precursors to more serious events are addressed by other specific EALs.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-2

1.5.73 5-3

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SU6 Unplanned Loss of All Onsite or Offsite Communications Capabilities.
1. Either of the following conditions exist:
a. Loss of all (site-specific list) onsite communications capability affecting the ability to perform routine operations.
OR
b. Loss of all (site-specific list) offsite communications capability.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Row 3: *Loss of all offsite communications capability from the Control Room/STSC. This includes normal PBX, dedicated lines, ringdown lines, ENS, NAN primary, and NAN radio*

Row 4: *Loss of all onsite communications capability affecting the ability to perform routine operations. This includes normal PBX, plant page system, two-way radio, and sound powered phone system*

LOCATION: Table 5: MALFUNCTIONS / Row 3, Row 4

TECHNICAL BASIS:

The purpose of this EAL is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate problems with offsite authorities. The loss of offsite communications ability is significantly more compre-hensive than the condition addressed by 10 CFR 50.72.

The offsite communications loss encompasses the loss of all means of communications with offsite authorities. This EAL is intended to be used only when extraordinary means are being utilized to make communications possible *(relaying of information from radio transmissions, individuals being sent to offsite locations, or any other method entailing communications with offsite authorities made possible from a location other than the Control Room / STSC).*

The onsite communications loss encompasses the loss of all means of routine communications.

NUMARC DEVIATION:

NONE. NUMARC/NESP-007 is not specific as to locations from which communications capabilities with offsite agencies are not possible. Since communications with offsite agencies are customarily originated from within the Control Room / STSC, PVNGS does not deviate from normal practices in this area.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-3

1.5.74 5-4 (page 1 of 2)

APP MODE: MODES 1 - 2

CLASS: ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful.
1. (Site-specific) indication(s) exist that indicate that reactor protection system setpoint was exceeded and automatic scram did not occur, and a successful manual scram occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was successful when in Modes 1-2

(manual shutdown includes reactor trip pushbuttons and/or removal of power to CEDMCS bus from the Control Room)

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient and thus, the plant safety has been compromised and design limits of the fuel may have been exceeded. An ALERT is indicated because conditions exist that lead to potential loss of fuel clad or RCS. Under these conditions, the ALERT is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Reactor Protection System setpoint being exceeded *(rather than limiting safety system setpoint being exceeded)* is specified here because failure of the automatic protection system is the issue. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons)*. Failure of a manual trip would escalate the event to an SAE.

An ALERT classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

5-4

1.5.75 5-4 (page 2 of 2)

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.76 5-5 (page 1 of 2)

APP MODE: **MODES 5 - 6** ***CLASS:*** **ALERT**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA3 Inability to Maintain Plant in Cold Shutdown.
1. The following conditions exist:
a. Loss of (site-specific) Technical Specification required functions to maintain cold shutdown.
AND
b. Temperature increase that either:
w Exceeds Technical Specification cold shutdown temperature limit
OR
w Results in uncontrolled temperature rise approaching cold shutdown technical specification limit.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function or system which precludes the ability to maintain Cold Shutdown and a temperature increase has occurred that either exceeds 210°F or results in an uncontrolled temperature rise approaching 210°F when in Modes 5-6

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

This EAL addresses complete loss of functions required for core cooling during Refueling and Cold Shutdown Modes.

This condition is based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal. A number of phenomena such as pressurization, vortexing, steam generator U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system *(SDC)* design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncovery can occur. NRC analyses show that sequences can cause core uncovery in 15 to 20 minutes and severe core damage within an hour after decay heat removal is lost. Under these conditions, RCS integrity is lost and fuel clad integrity is lost or potentially lost, which is consistent with an SAE classification. Indicators used as measurement for this EAL are those methods used by the plant in response to Generic Letter 88-17, which include Core Exit Thermocouples *(CETs)* and RCS water level monitoring. In addition, Radiation Monitoring System *(RMS)* readings may also be appropriate as an indicator of this condition.

5-5

1.5.77 5-5 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Uncontrolled" means that the system temperature increase is not the result of planned actions by the plant staff.

The EAL guidance related to the uncontrolled temperature rise is necessary to preserve the anticipatory philosophy of NUREG-0654 for events starting from temperatures much lower than the Cold Shutdown temperature limit.

NUMARC DEVIATION:

It is understood that if the plant is in conformance with Technical Specifications during operations within Cold Shutdown conditions, any functions required for OPERABILITY during this mode will be available to maintain Cold Shutdown. Hence, "Technical Specification required functions", as delineated in the NUMARC Example EAL, is redundant to that required for the specific mode and will be available for maintaining conditions required for that mode.

The Cold Shutdown temperature limit has been applied to the PVNGS EAL as a temperature of 210°F, which is the PVNGS Technical Specification upper temperature bounds of the modes applicable to this EAL.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.78 5-6 (page 1 of 2)

APP MODE: MODES 1 - 4 | *CLASS:* ALERT

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SA4 Unplanned Loss of Most or All Safety System Annunciation or Indication in Control Room With Either (1) a Significant Transient In Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable.
1. The following conditions exist:
a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.
AND
b. In the opinion of the Shift Supervisor, the loss of the annunciators or indicators requires increased surveillance to safely operate the unit(s).
AND
c. Annunciator or Indicator loss does not result from planned action.
AND
d. Either of the following:
1. A significant plant transient is in progress.
OR
2. Compensatory non-alarming indications are unavailable.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Unplanned loss of most or all safety system annunciation for > 15 minutes requiring increased monitoring while in Modes 1-4 and either compensatory indications are unavailable or a significant transient is in progress

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL is intended to provide recognition of the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a transient. Recognition of the availability of computer based indication equipment is considered *(SPDS, plant computer, etc.).*

"Unplanned" loss of annunciators or indicators excludes scheduled maintenance and testing activities.

Quantification of "Most" is arbitrary. However, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost, but use the value as a judgment threshold for determining the severity of the plant conditions. This judgment is supported by the specific opinion of the Shift Supervisor / Emergency Coordinator that additional operating personnel will be required to provide increased monitoring of system operation to safely operate the unit.

5-6

1.5.79 5-6 (page 2 of 2)

TECHNICAL BASIS (continued...):

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This is addressed by specific Technical Specifications. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification LCO Action Statement, then the declaration of a Notification of Unusual Event will be based on SU2-1, Inability to Reach Required Shutdown Within Technical Specification Limits.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor / Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment. If both a major portion of the annunciation system and all computer monitoring are not available to the extent that the additional operating personnel are required to monitor indications, the ALERT is required.

Due to the limited number of safety systems in operation during Cold Shutdown, Refueling, and Defueled Modes, no EAL is indicated for these modes of operation.

This ALERT will be escalated to an SAE if the operating crew cannot monitor the transient in progress.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system will audibly annunciate and the text associated with a particular parameter will change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it will also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.80 5-7 (page 1 of 2)

APP MODE: MODES 1 - 2 ***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS2 Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful.
1. (Site-specific) indications exist that automatic and manual scram were not successful.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to initiate or complete an automatic reactor shutdown (i.e., subcritical) once an RPS setpoint has been met or exceeded and manual shutdown was not successful when in Modes 1-2

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. An SAE is indicated because conditions exist that lead to imminent loss or potential loss of both fuel clad and RCS. Under these conditions, the SAE is indicated until RCS Chemistry analyses can verify fuel clad integrity, as indicated by sample results less than 300 μCi/gm Dose Equivalent I^{131}. Although this EAL may be viewed as redundant to the Fission Product Barrier Reference EAL, its inclusion is necessary to better assure timely recognition and emergency response. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons).*

A Site Area Emergency classification is warranted anytime it is unclear that an RPS trip setpoint had been met or exceeded. This EAL is not applicable only when positive assurance exists that no RPS trip setpoints had been met or exceeded prior to reactor shutdown.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

5-7

1.5.81 5-7 (page 2 of 2)

NUMARC DEVIATION (continued...):

"Instrumentation" is not specified due to the implication that the Reactor Protection System includes all associated electronic components, instrumentation, hardware, etc. which are required for the RPS to perform its intended function.

An RPS setpoint being "met" has been added to the EAL condition due to the incorporation of digital reactor trip functions within the Combustion Engineering *(CE)* Core Protection Calculators *(CPCs)* utilized at PVNGS as part of the reactor protection scheme. LO DNBR and HI LPD are among the several reactor trip setpoints that can be reached, but may not necessarily be exceeded. It is prudent to include them as part of the system.

"Reactor shutdown", as defined here, signifies the initial prompt drop characteristic of an immediate reactor trip response, along with a sustained negative startup rate indicative for some time following the initial prompt drop. Since the EAL is applicable to Modes 1 and 2, an automatic reactor trip is possible during a reactor startup *(i.e., < 5% rated thermal power)*, when a specified reactor power level may not be appropriate to include as one of the specified conditions within the EAL. For this reason, it becomes more appropriate to include specifications of a reactor shutdown in lieu of a "reactor scram" to indicate the conditions expected after a designated reactor trip.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993
File 94-002-493, Conversation Memorandum *(APS / NRR)*, 26JUL94 0840 MST

1.5.82 5-8

APP MODE: MODES 5 - 6

CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS5 Loss of Water Level in the Reactor Vessel That Has or Will Uncover Fuel in the Reactor Vessel.
1. Loss of Reactor Vessel Water Level as indicated by:
a. Loss of all decay heat removal cooling as determined by (site-specific) procedure.
AND
b. (Site-specific) indicators that the core is or will be uncovered.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of reactor vessel water level that has or will uncover fuel in the reactor vessel when in Modes 5-6 (RE: 4xAO-xZZ22; Safety Analysis Operational Data)

LOCATION: Table 5: MALFUNCTIONS / Row 2

TECHNICAL BASIS:

Under the conditions specified by this EAL, severe core damage can occur and Reactor Coolant System integrity may not be assured. This EAL covers sequences such as prolonged boiling following loss of decay heat removal. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

Site-specific indicators are not detailed in the EAL due to procedural direction delineating specific indications to be used in the assessment of reactor vessel water level. The Abnormal Operating Procedure also references the PVNGS Safety Analysis Operational Data Document to determine the associated core conditions based on time shutdown, vessel level, makeup flow rate, and core decay heat load.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ22, Loss of Shutdown Cooling, Rev. 06.14
PVNGS Safety Analysis Operational Data, Rev. 0
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.83 5-9

APP MODE: MODES 1 - 4 ***CLASS:*** SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS4 Complete Loss of Function Needed to Achieve or Maintain Hot Shutdown.
1. Complete loss of any (site-specific) function required for hot shutdown.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of any function (i.e., heat removal, reactivity control) or system which precludes the ability to achieve or maintain Hot Shutdown when in Modes 1-4

LOCATION: Table 5: MALFUNCTIONS / Row 3

TECHNICAL BASIS:

This EAL addresses complete loss of functions, including the ultimate heat sink and reactivity control, which are required to achieve or maintain Hot Shutdown. The Heat Removal Safety Function encompasses systems associated with removing heat from the core following plant shutdown, such as steam generators, which are required to be fed and steamed to be Operable, and the Shutdown Cooling System, which is required when steam generators are no longer needed or are unavailable for heat removal. The Reactivity Control Safety Function relies on shutdown margin requirements to ensure an unanticipated criticality situation does not occur, jeopardizing the RCS pressure boundary and possibly leading to core damage. Under these conditions, there is an actual major failure of a system intended for protection of the public. Thus, declaration of an SAE is warranted.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

5-9

1.5.84 5-10 (page 1 of 2)

APP MODE: MODES 1 - 4

CLASS: SAE

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SS6 Inability to Monitor a Significant Transient in Progress.
1. The following conditions exist:
a. Loss of (site-specific) annunciators associated with safety systems.
AND
b. Compensatory non-alarming indications are unavailable.
AND
c. Indications needed to monitor (site-specific) safety functions are unavailable.
AND
d. Transient in progress.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Loss of most or all safety system annunciation with a significant transient in progress while in Modes 1-4. Compensatory indications and indications needed to monitor safety functions are both not available

LOCATION: Table 5: MALFUNCTIONS / Row 4

TECHNICAL BASIS:

This EAL and its associated EALs are intended to recognize the inability of the Control Room staff to monitor the plant response to a transient. An SAE is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public.

PVNGS annunciation or indication related to this EAL encompasses the Radiation Monitoring System, ECCS related equipment, or any other annunciation or indication required to safely operate the plant.

"Compensatory indications", in this context, includes computer based information such as SPDS. Specifically, PVNGS equipment included as compensatory indications include ERFDADS *(and SPDS)*, QSPDS, Plant Monitoring System *(PMS)*, and any other computer system which, in the opinion of the Shift Supervisor/Emergency Coordinator, have the capability for use as surveillance and plant assessment equipment.

5-10

1.5.85 5-10 (page 2 of 2)

TECHNICAL BASIS (continued...):

"Significant Transient" includes response to automatic or manually initiated functions such as trips, runbacks involving greater than 25% thermal power change, ECCS injections, or thermal power oscillations of 10% or greater.

Indications needed to monitor safety functions necessary for protection of the public includes Control Room indications, computer generated indications *(i.e., QSPDS)*, and dedicated annunciation capability. The specific indications are those used to determine such functions as the ability to shut down the reactor, maintain the core cooled and in a coolable geometry, to remove heat from the core, to maintain the Reactor Coolant System intact, and to maintain containment integrity.

"Planned" actions are excluded from this EAL since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not an ameliorating factor.

NUMARC DEVIATION:

Compensatory indications are not specified as "non-alarming" due to the computer alarming capabilities associated with the Plant Monitoring System computer*(s)*. The system would audibly annunciate and the text associated with a particular parameter would change color on the CRT*(s)* when that input parameter changes state. If the PMS Alarm Typer is functional, it would also indicate a change of state for the associated parameter.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ55, Loss of Annunciators, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.86 5-11 (page 1 of 2) .

APP MODE: **MODES 1 - 2**

CLASS: **GE**

CATEGORY: [S] System Malfunction

NUMARC/NESP-007 INITIATING CONDITION:

SG2 Failure of the Reactor Protection System to Complete an Automatic Scram and Manual Scram Was **NOT** Successful and There is Indication of an Extreme Challenge to the Ability to Cool the Core.
1. (Site-specific) indications exist that automatic and manual scram were not successful.
AND
2. Either of the following:
a. (Site-specific) indications exist that the core cooling is extremely challenged.
OR
b. (Site-specific) indications exist that heat removal is extremely challenged.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Failure of RPS to complete an automatic reactor shutdown (i.e., subcritical) and manual shutdown was not successful when in Modes 1-2
AND
CET > 1200°F, or RVLMS < 21% plenum, or minimum acceptable feedwater flow cannot be maintained ·

LOCATION: Table 5: MALFUNCTIONS / Row 1

TECHNICAL BASIS:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor. A manual trip is any set of actions by the reactor operator*(s)* at the reactor control console *(or within the Control Room)* which causes control element assemblies *(CEAs)* to be rapidly inserted into the core and brings the reactor subcritical *(e.g., reactor trip pushbuttons).*

Under the conditions of this and associated EALs, the efforts to bring the reactor subcritical have been unsuccessful and, as a result, the reactor is producing more heat than the maximum decay heat load for which the safety systems were designed. Although there are capabilities away from the reactor control console, such as emergency boration, the continuing temperature rise indicates that these capabilities are not effective. This situation could be a precursor for a core melt sequence.

The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200°F or that the reactor vessel water level is below the top of the active fuel.

5-11

1.5.87 5-11 (page 2 of 2)

TECHNICAL BASIS (continued...):

Another consideration is the inability to initially remove heat during the early stages of this sequence. If Essential Auxiliary Feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist.

In the event either of these challenges exist at a time that the reactor has not been brought below the power associated with the safety system design *(typically 3%)*, a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the GE declaration is intended to be anticipatory of the Fission Product Barrier Reference declaration to permit maximum offsite intervention time.

NUMARC DEVIATION:

The term "scram" has been changed to "trip" in the Technical Basis Section due to current PVNGS terminology.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

1.5.88 6-1

APP MODE: MODES 1 - 6 — ***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU2 Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes of Detection.
1. Fire in buildings or areas contiguous to any of the following (site-specific) areas not extinguished within 15 minutes of control room notification or verification of a control room alarm.
w (Site-specific) list

PVNGS EMERGENCY ACTION LEVEL (EAL):

Fire affecting major structures or areas within the Protected Area not extinguished within 15 minutes of Control Room notification or Control Room alarm verification

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

The purpose of this EAL is to address the magnitude and extent of fires that may be potentially significant precursors to damage to safety systems. This excludes such items as fires within administration buildings, waste-basket fires, and other small fires of no safety consequence. This EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or areas that are not contiguous or immediately adjacent to plant vital areas. Verification of the alarm, in this context, means those actions taken in the Control Room to determine that the Control Room alarm is not spurious.

NUMARC DEVIATION:

Site-specific areas are not delineated in the PVNGS EAL due to the ramifications involved when a fire affects the Protected Area. Because PVNGS is a three-unit site, and because a listing of specific areas which could be affected by a fire within buildings and/or areas immediately contiguous to this site-specific listing would defeat the purpose of possessing the ability to determine if the fire is affecting the Protected Area, the Shift Supervisor / Emergency Coordinator will be better served when a determination has to be made at the time whether the Protected Area is affected or not. The term "affecting major structures or areas within the Protected Area" is used here in the same context as is used elsewhere within the "HAZARDS" Event Category.

The 15 minute time period for a fire to be extinguished prior to declaration, in itself, allows for the exclusion of extremely small fires *(i.e., waste-basket fires, etc.)* which are easily extinguished, and sets a measurable standard which recognizes that any increase in the length of time a fire burns increases the risk of damage to equipment or injury to plant personnel.

A site-specific listing of possible Control Room annunciators that may be relevant to the diverse set of related fires appropriate to this EAL is not included within the text of the EAL due to procedural direction within the Control Room involving priorities established for operator response within those procedures. The annunciator responses *(several hundred, each specific to a designated area or component)* established for the Fire Alarm Terminal CRT are used in conjunction with the Pre-Fire Strategies Manual by Control Room and Fire Protection personnel in assessing and responding to fires within the facility.

SOURCE DOCUMENT:
PVNGS Pre-Fire Strategies Manual, Rev. 6
Fire Point/Zone Alarm Book
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-1

1.5.89 6-2

APP MODE: MODES 1 - 6	CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
5. Report by plant personnel of an unanticipated explosion within protected area boundary resulting in visible damage to permanent structure or equipment.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Explosion affecting the Protected Area resulting in visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

The Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04.

Only those explosions of sufficient force to damage permanent structures or equipment within the Protected Area are considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., deformation, scorching)* is sufficient for declaration. The SS / EC also needs to consider any security aspects of the explosion, if applicable.

NUMARC DEVIATION:

NONE. The grammatical structure of the EAL lends itself to visible damage as reported by site personnel.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-2

1.5.90 6-3

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
4. Vehicle crash into plant structures or systems within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact into plant structures or systems within the Protected Area

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile that may potentially damage plant structures containing functions and systems required for safe shutdown of the plant. The event is escalated to an ALERT if the crash is confirmed to affect a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems within the Protected Area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-3

1.5.91 6-4

APP MODE: MODES 1 - 6	CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU3 Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant.
1. Report or detection of toxic or flammable gases that could enter within the site area boundary in amounts that can affect normal operation of the plant.
2. Report by Local, County, or State Officials for potential evacuation of site personnel based on offsite event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Release of toxic or flammable gases that could enter the Site Boundary and deemed detrimental to safe operation of the plant

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on releases in concentrations within the Site Boundary that will affect the health of plant personnel or affecting the safe operation of the plant with the plant being within the evacuation area of an offsite event *(i.e., tanker truck accident releasing toxic gases, etc.).* In the latter case, the evacuation area will be as determined from the DOT Evacuation Tables for Selected Hazardous Materials, located in the DOT Emergency Response Guide for Hazardous Materials.

NUMARC DEVIATION:

The EAL does not address toxic or flammable gas origins or causes for evacuations of personnel located within the Site Area Boundary due to an offsite event. Gases that could enter the Site Boundary encompass causes for evacuation. The EAL addresses the impact to personnel and the safe operation of the plant, regardless of the origin of these evacuation directives.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-4

1.5.92 6-5

APP MODE: MODES 1 - 6 ***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
6. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure causing casing penetration or damage to turbine oil seals or generator seals

LOCATION: Table 6: HAZARDS / Row 5

TECHNICAL BASIS:

This EAL is intended to address main turbine rotating component failure of sufficient magnitude to cause observable damage to the turbine casing or to the seals of the turbine generator. Of major concern is the potential for leakage of combustible fluids *(lubricating oils)* and gases *(hydrogen cooling)* to the plant environs. Actual fires and flammable gas build-up are appropriately classified via HU2 and HU3. This EAL is consistent with the definition of an NUE while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment.

NUMARC DEVIATION:

"Turbine oil seals" is indicated to clarify the intent of the EAL. Damage to the turbine casing is determined by visual and/or indicated observations from the Control Room *(i.e., visual CRT display of turbine bearing vibrations and condenser vacuum indicators)*. Sufficient instrumentation exists to adequately determine turbine failures involving seal failures which conform to the intent of this EAL. A reliance is implied, though, for visual damage indications by plant personnel.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-5

1.5.93 6-6

APP MODE: MODES 1 - 6	***CLASS:*** NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
1. (Site-specific) method indicates felt earthquake.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Valid "Strong Motion Accelerometer System Trigger" indicated on Seismic Warning Panel per 79IS-9SM01

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL references PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, which is performed by the Shift Technical Advisor upon receipt of a "SEISMIC OCCURRENCE" Control Room annunciation. Under the intent of this EAL, damage may be caused to some portions of the site, but should not affect ability of safety functions to operate. The method of detection is based on instrumentation and validated by the aforementioned procedure. As defined in the EPRI-sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, a "felt earthquake" is:

An earthquake of sufficient intensity such that : *(a)* the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and *(b)* for plants with operable seismic instrumentation, the seismic switches of the plant are activated. For most plants with seismic instrumentation, the seismic switches are set at an acceleration of about 0.01g.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-6

1.5.94 6-7

APP MODE: MODES 1 - 6 | *CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
2. Report by plant personnel of tornado striking within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Tornado affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the assumption that a tornado striking *(touching down)* within the Protected Area Boundary may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. If such damage is confirmed visually or by other in-plant indications, the event will be escalated to an ALERT.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-7

1.5.95 6-8

APP MODE: **MODES 1 - 6** ***CLASS:*** **NUE**

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
7. (Site-Specific) Occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding affecting the Protected Area

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-8

1.5.96 `6-9

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA2 Fire or Explosion Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown.
1. The following conditions exist:
a. Fire or explosion in any of the following (site-specific) areas:
w (Site-specific) list
AND
b. Affected system parameter indications show degraded performance or plant personnel report visible damage to permanent structures or equipment within the specified area.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Fire or explosion affecting safety systems required for the current operating Mode as indicated by degraded performance or as indicated by plant personnel reporting visible damage (e.g., deformation, scorching) to permanent structures or equipment

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:
Equipment and plant areas required for the current operating Mode are delineated in PVNGS Technical Specifications. As such, a determination can be made if the fire or explosion is potentially affecting one or more redundant trains of safety systems which are required to be OPERABLE for the current operating Mode. With regard to explosions, only those explosions of sufficient force to damage permanent structures or equipment required for safe operation within the identified plant area should be considered. As used here, an explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment, that potentially imparts significant energy to near-by structures and materials. The inclusion of a "report of visible damage" should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage *(e.g., dèformation, scorching)* is sufficient for declaration. The declaration of an ALERT and the activation of the TSC will provide the Emergency Operations Director *(EOD)* with the resources needed to perform these damage assessments. The EOD also needs to consider any security aspects of the explosion*(s)*, if applicable.

NUMARC DEVIATION:
Specifying "plant areas and equipment required for the current operating Mode" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of functions and systems applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details functions and systems required to be OPERABLE for applicable Modes.

SOURCE DOCUMENT:
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-9

1.5.97 6-10

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA5 Control Room Evacuation Has Been Initiated.
1. Entry into (site-specific) procedure for control room evacuation.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Entry into 4xAO-xZZ27 or 4xAO-xZZ44 for Control Room evacuation

LOCATION: Table 6: HAZARDS / Row 2

TECHNICAL BASIS:

With the Control Room evacuated, additional support with monitoring and direction through the Technical Support Center and/or Emergency Operations Facility is necessary. Inability to establish plant control from outside the Control Room will escalate this event to an SAE.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ27, Shutdown Outside Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-10

1.5.98 6-11

APP MODE: MODES 1 - 6	CLASS: ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
5. Vehicle crash affecting plant vital areas.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Vehicle/aircraft crash or missile impact affecting plant vital areas

LOCATION: Table 6: HAZARDS / Row 3

TECHNICAL BASIS:

This EAL is intended to address such items as plane or helicopter crash, train crash, or any vehicle or missile affecting a plant vital area.

NUMARC DEVIATION:

NONE. PVNGS expands on particulars in this EAL so that the intended meaning of encompassing vehicles is apparent. "Missile" is added as a vehicle form which could cause damage to plant structures containing functions and systems required for safe shutdown of the plant. The consequences of damage to plant structures or systems affecting a plant vital area resulting from missile impacts are not unlike the consequences of damage associated with vehicle impacts.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

1.5.99 6-12

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
3. Report of any visible structural damage on any of the following plant structures:
w Reactor Building
w Intake Building
w Ultimate Heat Sink
w Refueling Water Storage Tank
w Diesel Generator Building
w Turbine Building
w Condensate Storage Tank
w Control Room
w Other (Site-Specific) Structures

PVNGS EMERGENCY ACTION LEVEL (EAL):

Visible structural damage to any building containing safe shutdown equipment

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL addresses structures containing systems and functions required for safe shutdown of the plant. The structural damage implied has origins related to any destructive phenomena not explicitly addressed in any other EAL in this category.

NUMARC DEVIATION:

Specifying "any building containing safe shutdown equipment" facilitates the intent of the EAL in lieu of specifying all-encompassing lists of plant structures and buildings applicable to operating Modes requiring their Operability. PVNGS Technical Specifications details plant structures and buildings required to be OPERABLE for applicable Modes as delineated within Limiting Conditions for Operation *(LCOs)* requiring Operability for all supporting equipment and functions needed for Operability of the applicable system or function.

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-12

1.5.100 6-13

APP MODE: MODES 1 - 6 ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA3 Release of Toxic or Flammable Gases Within a Facility Structure Which Jeopardizes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown.

1. Report or detection of toxic gases within a Facility Structure in concentrations that will be life threatening to plant personnel.
2. Report or detection of flammable gases within a Facility Structure in concentrations that will affect the safe operation of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Toxic or flammable gas within a facility structure affecting operation of safety systems required for the current operating Mode or is life threatening to personnel within those structures per site Fire Department analyses

LOCATION: Table 6: HAZARDS / Row 4

TECHNICAL BASIS:

This EAL is based on gases that have entered a plant structure affecting the safe operation of the plant. The EAL applies to buildings and areas contiguous to plant vital areas or other significant buildings or areas. The intent of this EAL is not to include buildings *(i.e., warehouses)* or other areas that are not contiguous or immediately adjacent to plant vital areas. It is appropriate that increased monitoring be done to ascertain whether consequential damage has occurred. The PVNGS site Fire Department operates under OSHA guidelines in determining if facility structures meet habitability requirements. They are staffed continuously and are trained and required to respond to hazardous materials, hazardous atmospheres, etc.

NUMARC DEVIATION:

This EAL has been phrased to allow for the inclusion of safe plant operations encompassing both plant personnel and safety systems required for the current operating Mode. Equipment required for the establishment and maintenance of Cold Shutdown is required to be OPERABLE in Modes specifying the applicability.

SOURCE DOCUMENT:

PVNGS Procedure 14AC-0FP02, Emergency Notification and Response, Rev. 02.02
PVNGS Procedure 14DP-0FP27, PVNGS Fire Department Hazardous Incident Response, Rev. 00.00
PVNGS Unit 1 Technical Specifications, Amendment 74
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-13

1.5.101 6-14

APP MODE: MODES 1 - 6	***CLASS:*** ALERT
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
6. Turbine failure generated missiles result in any visible structural damage to or penetration of any of the following plant areas: (site-specific) list.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Main turbine failure generating missiles which result in visible damage to structures containing safety related equipment

LOCATION: Table 6: HAZARDS / Row 6

TECHNICAL BASIS:

This EAL is intended to address the threat to safety related equipment imposed by missiles generated by main turbine rotating component failures. Since PVNGS was designed to minimize impacts to safety related equipment caused by main turbine rotating component failures *(i.e., no safety related equipment is located on a tangent to turbine rotational direction)*, there are no areas within which damage to structures containing this equipment can be affected by ejected turbine components. Catastrophic failure of the main turbine rotating components, though, would likely cause damage to the main condenser, condensate and/or circulating water system*(s)* piping, or personnel in the vicinity. However, this EAL is consistent with the definition of an ALERT in that if missiles have damaged or penetrated areas containing safety related equipment, the potential exists for substantial degradation of the level of safety of the plant.

NUMARC DEVIATION:

No listing of structures containing safety related equipment specific to PVNGS is included in the EAL due to the inherent characteristics of the manufacturers' design of the plant *(i.e., Bechtel, Combustion Engineering)*. No safety related equipment is located on a tangent to the rotational direction of the main turbine spindles.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-14

1.5.102 6-15

APP MODE: MODES 1 - 6	***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
1. (Site-Specific) method indicates Seismic Event greater than Operating Basis Earthquake (OBE).

PVNGS EMERGENCY ACTION LEVEL (EAL):

Confirmed earthquake > OBE levels per 79IS-9SM01 such that preliminary analysis indicates OBE validity

LOCATION: Table 6: HAZARDS / Row 7

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Seismic events of this magnitude can cause damage to safety functions. The determination of the magnitude of the seismic event is based on preliminary analysis by the Shift Technical Advisor that the OBE annunciation is valid. The event classification can then be declared in a prompt manner. Performance of 79IS-9SM01, Analysis of Seismic Event, by the STA upon receipt of "SEISMIC OCCURRENCE" Control Room annunciation is then performed as appropriate to the indications.

NUMARC DEVIATION:

NONE

SOURCE DOCUMENT:

PVNGS Unit 1 Technical Specifications, Amendment 74
PVNGS Procedure 41AL-1RK7C, Panel B07C Alarm Responses, Rev. 03.23
PVNGS Procedure 79IS-9SM01, Analysis of Seismic Event, Rev. 2
PVNGS Updated Final Safety Analysis Report (UFSAR), Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-15

1.5.103 6-16

APP MODE: MODES 1 - 6	***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
2. Tornado or high winds striking plant vital areas: Tornado or high winds greater than (site-specific) mph strike within protected area boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Sustained winds > 105 mph (design levels) or tornado with average winds > 300 mph (design basis) per 4xAO-xZZ58

LOCATION: Table 6: HAZARDS / Row 8

TECHNICAL BASIS:

This EAL is based on the plant FSAR design basis. Wind loads of this magnitude can cause damage to safety functions. Sustained winds of > 105 mph or tornados with cyclonic velocities exceeding 260 mph *(Category F5)* with simultaneous tangential movement of 40 mph *(i.e., 260 + 40 = 300 mph)* are design levels per the PVNGS FSAR. Sustained winds are wind speeds averaged over one minute that generally remain continuous for at least 15 minutes *(NOAA-NWS definition)* and exclude localized gusts exceeding these wind velocity limits.

NUMARC DEVIATION:

NONE. "Sustained" winds are based on National Weather Service *(NWS)* forecasts and/or warnings issued locally. Per NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993, meteorological tower data should not be used for weather assessments regarding wind velocities of this force for emergency classification purposes. Estimated sustained winds furnished by the National Weather Service should provide the basis for emergency classification purposes. EAL HA1-3 will provide evidence of damage to safe shutdown structures when winds of this nature are exceeded.

SOURCE DOCUMENT:

PVNGS Procedure 41AO-1ZZ58, Severe Weather, Rev. 00.01
PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2, Questions and Answers, June 1993

6-16

1.5.104 6-17

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
7. (Site-Specific) occurrences.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Flooding potentially affecting safety systems required for the current operating Mode

LOCATION: Table 6: HAZARDS / Row 9

TECHNICAL BASIS:

This EAL covers flooding incidents specific to naturally occurring phenomena which can lead to more serious events. It is based on the site-specific 50- and 100-year flooding events as delineated in the site Environmental Impact Study.

NUMARC DEVIATION:

No observable parameter is included within this EAL. Section 2.4.2.2.1 of the PVNGS UFSAR states that the probable maximum flood stage of elevation 776 is 175 feet below the lowest plant grade of 951 at Unit 3. The site is also protected from the Hassayampa River to the east by a topographic ridge at minimum elevation 975. Protection of safety-related facilities from inundation by offsite flood sources is achieved by the location of the facilities beyond the extent of flooding. The site drainage system and grading plan is designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to the Probable Maximum Thunderstorm Precipitation. The effect that flooding of this extent could have on "safety systems required for the current operating Mode" is consistent with other hazards and naturally occurring events of this type.

SOURCE DOCUMENT:

PVNGS Updated Final Safety Analysis Report *(UFSAR)*, Rev. 5
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-17

1.5.105 6-18

APP MODE: **MODES 1 - 6** | ***CLASS:*** **SAE**

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS2 Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established.
1. The following conditions exist:
a. Control room evacuation has been initiated.
AND
b. Control of the plant cannot be established per (site-specific) procedure within (site-specific) minutes.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Evacuation of Control Room and control not established locally at the Remote Shutdown Panel within 15 minutes

LOCATION: Table 6: HAZARDS / Row 1

TECHNICAL BASIS:

Expeditious transfer of safety systems has not occurred but fission product barrier damage may not yet be indicated. PVNGS Engineering Calculation 13-MC-FP-317, 10CFR50, Appendix R Operational Considerations, establishes 23 minutes for initiating Auxiliary Feedwater to the steam generator*(s)* as the most limiting initial action which must be taken under these conditions. However, the 15 minute time period established generically for transfer of safety system control to the Remote Shutdown Panel*(s)* is based on an assessment as to how quickly control must be re-established without core uncovering and/or core damage possibly taking place. *(Based on the generic basis, this time period must never exceed 15 minutes.)* In Cold Shutdown and Refueling Modes, operator concern is directed toward maintaining core cooling such as is discussed in Generic Letter 88-17, Loss of Decay Heat Removal. In power operation, Hot Standby, and Hot Shutdown Modes, operator concern is primarily directed toward maintaining critical safety functions and thereby assuring fission product barrier integrity.

NUMARC DEVIATION:

Evacuation of the Control Room requires direction from an appropriate procedure in use. The procedures reference the Emergency Classification Procedure as an implementation.

SOURCE DOCUMENT:

Engineering Calculation 13-MC-FP-317, 10CFR50 Appendix R Operational Considerations, 29 JUL 93
PVNGS Procedure 41AO-1ZZ27, Shutdown Outside the Control Room, Rev. 02.17
PVNGS Procedure 41AO-1ZZ44, Control Room Fire, Rev. 03.07
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

6-18

1.5.106 7-1

APP MODE: MODES 1 - 6	*CLASS:* NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU4 Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant.
1. Bomb device discovered within plant protected Area and outside the plant Vital Area.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Declared Security Color Code Condition - Red (Security Emergency) indicating a potential degradation in the level of safety of the plant

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

This EAL is based on the PVNGS Site Security Plan. Security events which do not represent at least a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 or, in some cases, under 10 CFR 50.72. The plant Protected Area Boundary is that part within the Security Isolation Zone and is defined in PVNGS Procedure 20AC-0SK04. A bomb discovered in the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Color Code Condition - Red *(Security Emergency).*

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-1

1.5.107 7-2

APP MODE: MODES 1 - 6	*CLASS:* ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA4 Security Event in a Plant Protected Area.
1. Intrusion into plant protected area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within the Protected Area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

The Control Room Shift Supervisor should declare this EAL when there is direct evidence that hostile forces are or have been inside the Protected Area, but the Control Room or any vital area are not currently threatened. The Shift Supervisor should also consider this EAL in situations where the presence of hostile forces within the Protected Area is indicated by sabotage to plant equipment, but the full extent of damage to equipment or the full scope of the sabotage may not yet be known. This class of security events represents an escalated threat to plant safety above that contained in the NUE. For the purposes of this EAL, a civil disturbance which penetrates the Protected Area Boundary can be considered a hostile force and, as such, the intrusion of this hostile force into the plant Protected Area falls within the scope of this EAL and would constitute a security event.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-2

1.5.108 7-3

APP MODE: MODES 1 - 6

CLASS: SAE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS1 Security Event in a Plant Vital Area.
1. Intrusion into plant vital area by a hostile force.
2. Other security events as determined from (site-specific) Safeguards Contingency Plan.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event within any vital area (RE: 40AC-0OP07)

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Hostile forces consist of one or more persons armed with any sort of weapon*(s)* whose intent is evident by declaration or action to cause damage to plant equipment or injury to plant personnel. The principal role in dealing with a security threat belongs to the security forces. The role of the operator is to ensure to the maximum extent possible under the circumstances that the health and safety of the public is protected. Entry of hostile forces inside the protected area compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. Hostile forces may seek to damage plant equipment and cause a release, or injure or kill plant operating staff. Situations where hostile forces are known to have entered the Protected Area places the Control Room, Remote Shutdown Panels, or other areas defined as vital in the unit security plans at extreme and immediate risk. Entry of hostile forces inside the protected area undoubtedly constitutes a situation in which there is an actual or potential substantial degradation in the level of plant safety. This class of security events represents an escalated threat to plant safety above that contained in the ALERT in that a hostile force has progressed from within the Protected Area to a vital area.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-3

1.5.109 7-4

APP MODE: MODES 1 - 6	CLASS: GE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HG1 Security Event Resulting in Loss of Ability to Reach and Maintain Cold Shutdown.
1. Loss of physical control of the control room due to security event.
2. Loss of physical control of the remote shutdown capability due to security event.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Security event resulting in the loss of ability to reach and maintain Cold Shutdown from the Control Room or Remote Shutdown Panel

LOCATION: Table 7: SECURITY / Row 1

TECHNICAL BASIS:

Entry of hostile forces into the Control Room or Remote Shutdown Panel Room*(s)* compromises the ability of operators to perform their duty, since the ultimate goal of the hostile forces is unpredictable. If the hostile forces are known to have entered the Control Room or Remote Shutdown Panel Room*(s)* or other vital plant areas, the freedom of operators to maintain the plant in a safe operating condition is lost. This EAL encompasses conditions under which a hostile force has taken physical control of the Control Room, Remote Shutdown Panel Room*(s)*, or any other vital area required to reach and maintain safe shutdown conditions. Although actual core melt or loss of containment integrity has not occurred and there is no immediate evidence of substantial releases in progress, control of the reactor plant by hostile forces undoubtedly constitutes the most serious possible threat.

NUMARC DEVIATION:

NONE. The PVNGS Site Security Plan contains Contingency Plans for specific events and would be based on declaration of a Security Emergency.

SOURCE DOCUMENT:

PVNGS Procedure 20AC-0SK04, Protected/Vital Area Personnel Access Control, Rev. 09.00
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

7-4

1.5.110 8-1

APP MODE: MODES 1 - 6	***CLASS:*** NUE
CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety	

NUMARC/NESP-007 INITIATING CONDITION:

HU1 Natural and Destructive Phenomena Affecting the Protected Area.
3. Assessment by the control room that an event has occurred.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting the Protected Area

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(i.e., an earthquake is felt but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-1

1.5.111 8-2

APP MODE: MODES 1 - 6

CLASS: NUE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HU5 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Unusual Event.
1. Other indications exist which in the judgment of the Emergency Director indicate a potential degradation of the level of safety of the plant.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate a potential degradation of the level of safety of the plant

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the NUE emergency class.

From a broad perspective, one area that may warrant SS/EC judgment is related to likely or actual breakdown of PVNGS event mitigating actions. Examples to consider include inadequate emergency response procedures *(e.g., Emergency Plan Implementing Procedures, etc.)*, transient response either unexpected or not understood, failure or unavailability of emergency systems during an accident in excess of that assumed in accident analyses, or insufficient availability of equipment and/or support personnel.

Specific examples of actual events that may require SS/EC judgment for an NUE declaration are listed below for consideration. However, this list is by no means all inclusive and is not intended to limit the discretion of the SS/EC judgment in applying further examples.

w Aircraft crash on site
w Train derailment on site
w Near-site explosion which may adversely affect normal site activities
w Near-site release of toxic or flammable gas which may adversely affect normal site activities
w Uncontrolled RCS cooldown due to secondary side depressurization

It is also intended that the SS/EC judgment not be limited by any list of events as defined here or as augmented by the site. This list is provided solely as examples for consideration and it is recognized that actual events may not always follow a pre-conceived description.

NUMARC DEVIATION:
NONE

SOURCE DOCUMENT:
NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-2

1.5.112 8-3

APP MODE: MODES 1 - 6 | ***CLASS:*** ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA1 Natural and Destructive Phenomena Affecting the Plant Vital Area.
4. (Site-Specific) indications in the control room.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Control Room assessment that an event has occurred affecting plant vital areas

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL allows for the Control Room staff to determine that an event has occurred and take appropriate action based on personal assessment as opposed to verification *(e.g., an earthquake is believed to exceed OBE levels but does not register on any plant-specific instrumentation due to malfunction of the instrumentation, etc.).*

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-3

1.5.113 8-4

APP MODE: MODES 1 - 6	CLASS: ALERT

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HA6 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert.

1. Other indications exist which in the judgment of the Emergency Director indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate that plant safety systems may be degraded and that increased monitoring of plant functions is warranted

LOCATION: Table 8: MISCELLANEOUS / Row 2

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SS/EC to fall under the ALERT emergency class. If the SS/EC believes that increased monitoring of plant functions is warranted and deems that activation and staffing of Emergency Response Facilities is required for this monitoring, then the ALERT declaration is warranted.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-4

1.5.114 8-5

APP MODE: **MODES 1 - 6** ***CLASS:*** **SAE**

CATEGORY: **[H]** Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HS3 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a Site Area Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate actual or likely major failures of plant functions needed for protection of the public.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate actual or likely major failure of plant functions needed for protection of the public

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the emergency class description for SAE.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-5

1.5.115 8-6

APP MODE: MODES 1 - 6

CLASS: GE

CATEGORY: [H] Hazards and Other Conditions Affecting Plant Safety

NUMARC/NESP-007 INITIATING CONDITION:

HG2 Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency.
1. Other indications exist which in the judgment of the Emergency Director indicate: *(1)* actual or imminent substantial core degradation with potential for loss of containment, or *(2)* potential for uncontrolled radionuclide releases. These releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the site boundary.

PVNGS EMERGENCY ACTION LEVEL (EAL):

Other conditions exist which, in the judgment of the SS/EC, indicate:

(1) actual or imminent substantial core degradation with potential for loss of CTMT, or
(2) potential for uncontrolled radionuclide releases that can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary

LOCATION: Table 8: MISCELLANEOUS / Row 1

TECHNICAL BASIS:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Operations Director *(EOD)* to fall under the GE class.

NUMARC DEVIATION:

NONE.

SOURCE DOCUMENT:

NUMARC/NESP-007, Methodology for Development of Emergency Action Levels, Rev. 2

8-6

Appendix R - Dose Projection Technical Bases

1.0 DOSE PROJECTION TECHNICAL BASES

1.1 Introduction

1.1.1 This document provides various supporting information related to dose assessment activities above and beyond that available in the instructions for Dose Projection, Protective Actions, and the Emergency Exposure/KI. It is intended to be used primarily by the EOF Staff.

1.1.2 This section contains the following subsections:

1.1.2.1 Aids to project dose in an un-monitored release situation. Typical situations where this information may be useful would be a fire (outdoors or in a building) where the release is directly to atmosphere (un-filtered). Other situations might involve a release from the Fuel Building or Auxiliary Building due to an open door or breach; or an outdoor large storage tank being vented directly to atmosphere.

1.1.2.2 The modeled accidents in Mesorem Jr. utilize "standard" and default data in order to expedite the release projection. This section provides information to fine tune a projection by adjustment of various entries. Also provided is detailed accident specific information which may be requested by ARRA or the NRC.

1.1.2.3 Mesorem Jr. can be used to provide additional information beyond the initial dose projections; such as using a completed grab sample analysis to verify a projection, or assigning an important offsite location an individual receptor point. This section covers some selected options in those areas.

1.1.2.4 Source Term Monitoring general information and job aids are provided.

1.1.2.5 Control of dose must be done on a TEDE basis rather than relying on Whole Body dose. Until completed airborne sample data is available, the CEDE component of the TEDE will be unknown. This section provides information on how to use the External EDE and TEDE projected doses from the Mesorem Jr. printout to determine the expected ratio.

1.1.2.6 A methodology to adjust a Mesorem Jr. projection to actual field readings is provided.

1.1.2.7 General RMS information is provided.

1.2 Isolated Containment supporting information

1.2.1 The accident assumption is that a LOCA is occurring inside an isolated containment; with the release being the summed leakage to atmosphere from all of the containment penetrations (even though the penetrations are for the most part in the Aux. Bldg.). This selection may be used for any accident causing airborne activity in an Isolated Containment. The release calculation is based on a correlation of airborne activity to the higher of the RU-148/149 readings.

1.2.1.1 Mesorem requires Rem/hr values for RU-148/149; DO NOT INPUT mRem/hr.

1.2.1.2 Note that a failed fuel situation may cause elevated readings on these monitors even though there is no airborne activity in containment to be released.

1.2.1.3 As the typical leakage is small, extreme monitor levels are needed to result in a significant release.

1.2.2 RU-148/149 correlation reading

1.2.2.1 If RU-148/149 are Inoperable, (or suspect) a calculation has been performed and a chart made (Page 5 this section) such that readings from any of several RU monitors outside containment may be used to correlate to a RU-149 level. Closed Window dose rates taken at the alternate detector geometry may be substituted if available.

1.2.3 Containment Leak Rate

1.2.3.1 The default leakage is assumed to be 852 cc/sec per FSAR Section 6.2.1, Table 6.2.1-3, "Principal Containment Design Parameters"; the containment design level leak rate is 0.1% of the free volume per day at 60 PSIG with a containment free volume of 2.6E6 Cubic Feet (7.36E10 Cubic Centimeters).

1.2.3.2 Increasing Leak Rates per time

0.1	% per day	8.52 E2 cc/sec	(Default)
1.0	% per day	8.52 E3 cc/sec	
0.1	% per hour	2.04 E4 cc/sec	
10	% per day	8.52 E4 cc/sec	
1.0	% per hour	2.04 E5 cc/sec	
100	% per day	8.52 E5 cc/sec	
10	% per hour	2.04 E6 cc/sec	
100	% per hour	2.04 E7 cc/sec	

1.2.3.3 Actual Leak Rates will be difficult for the Technical Staff to determine during an event; ask for bounding estimates within the above alternates.

1.2.4 Basis of mix used for MESOREM projection

1.2.4.1 Reg Guide 1.4, "Assumptions used for evaluating the potential radiological consequences of a loss of coolant accident for pressurized water reactors" calls for the following assumptions to be made by license applicants:

- 25% of the Iodine inventory should be assumed to be available for leakage.
- 100% of the Noble Gas inventory should be assumed to be available - a reduction of the amount of material available for leakage may be taken for containment spray effects, but the amount of reduction should be evaluated on an individual case basis (there is no built-in Mesorem adjustment for this).
- FSAR 6.5.2.2 states that only 6% of the containment volume is unsprayed.

1.2.4.2 For the first 24 hours of an accident, the containment leak rate should assume Technical Specification leak rate at peak accident pressure.

1.2.5 ARRA/NRC - Both groups have procedural requirements which require more data. To be prepared to answer questions the below may be reviewed.

1.2.5.1 Is 20% or greater Core Damage projected or in progress?

- The Mesorem projection will provide an estimated Core Damage Fraction (CDF) in percent. This will not equate readily with the NRC Categories of Fuel Failure, but will provide an indication of the amount of core damage. Provide Tech Staff with the CDF given by Mesorem, and have them determine estimated damage.

1.2.5.2 Will the inventory in Containment exceed the PAGs if released at a 100% per day leak rate?

- The projection dose rate and dose values based on an 852 cc/sec leak rate are multiplied by 1000 to obtain 100% release per day values; and by 24,000 to obtain 100% release per hour values.

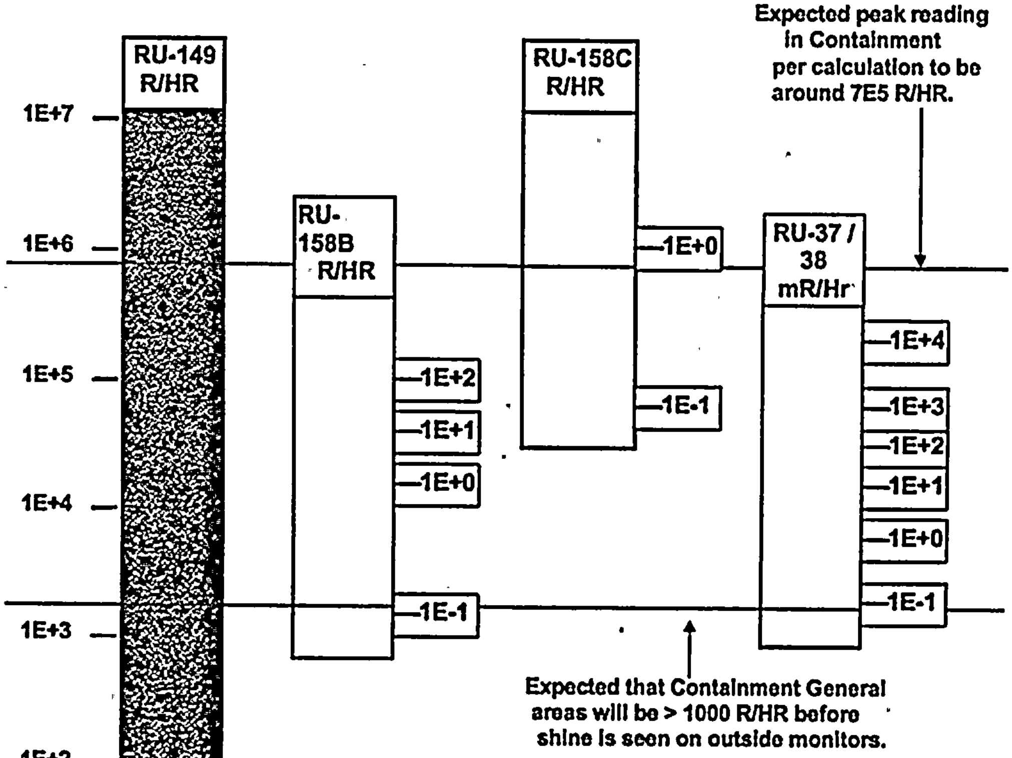
1.2.5.3 What is the expected dose at Site Boundary if the leak rate increases by a factor of 10 or 100?

- If RU-148 has the same reading when the leak rate increases by a factor of ten, the projected Site Boundary dose will also increase by a factor of 10.

1.2.6 The following table provides a visual idea of the RU-148 levels required to obtain similar Site Boundary Dose rates as leak rates vary. The calculations reflect the RU-148 readings that would meet the EAL 3-16 and 3-19 levels. These are worst case scenario calculations done with default met data, shortest distance to Site Boundary, etc.

Leak Rate from Containment	RU-148 in Rem/hr	EAL 3-16 Criteria met @Site Boundary	EAL 3-19 Criteria met @Site Boundary
100%/Day	80	100 mRem/hr TEDE	
(8.52E5 cc/sec)	500		1 Rem/hr TEDE
10%/Day	500	100 mRem/hr TEDE	
(8.52E4 cc/sec)	2800		1 Rem/hr TEDE
1%/Day	2800	100 mRem/hr TEDE	
(8.52E3 cc/sec)	13,300		5 Rem/hr Thyroid CDE
.1%/Day	13,300	500 mRem/hr Thyroid CDE	
(8.52E2 cc/sec)	36,500		5 Rem/hr Thyroid CDE

1.2.7 CONTAINMENT DOSE RATE ESTIMATION USING AREA MONITORS EXTERNAL TO CONTAINMENT



INSTRUCTIONS: obtain a reading from as many of the above as are available. Hand Dose Rates taken near the detectors (closed window) can be used if available on that column. Use a ruler laid horizontally across page to obtain the best fit with all available readings. The equivalent RU-149 reading in the left column may be used in an Isolated Containment dose projection.

RU-37/RU-38 - Power Access Purge Area monitors; GM tubes with a range of 0.1 to 10,000 mRem/Hr.
RU-158B/RU-158C-Accident range area monitors; ion-chambers with a range of 0.1 to 10,000 Rem/Hr.

1.3 Steam Generator Tube Rupture supporting information

1.3.1 Steam Generator Tube Rupture

1.3.1.1 The release path may be steam released directly via the Main Steam Safety Valves (MSSVs); the Atmospheric Dump Valves (ADVs) or the Steam Bypass Control System valves (SBCS numbered 1007 and 1008).

1.3.1.2 The release path may be through the Plant Vent Stack from the condenser air removal line (and through the Condenser Air Removal filter if lined up).

1.3.1.3 The release will most likely be a combination of the above, with a very complex situation of valves opening varying percentages for varying periods. The initial projections will be very conservative, and the EOF Staff should make it a priority to break down the release into more accurate separate calculations. It is essential that the Operations/Technical Staff assist in this effort.

1.3.1.4 A possibility exists that a Steam Generator could fill completely during an accident (go solid). If a generator would fill with primary side water such that fresh primary is being dumped to the atmosphere all projected Thyroid CDE data should be multiplied by 100.

1.3.2 Early indicators

1.3.2.1 An early indication of a primary/secondary leak at power will be given by the RU-142 monitors, Channels 1 through 4. They will indicate roughly 40 cpm to 300 cpm as conditions change from normal (no leaks) to about 30 GPD. This reading is quantitative only, as where the leak physically occurs in the Steam Generator will have a significant effect on the N-16 carryover activity. Therefore the primary use of these monitors will be in the initial leak phase, prior to reactor shutdown. Increases seen on these channels will be one of the first indications that a leak is occurring, and will serve to verify any RU-4/5/139/140/141 increases seen. In a significant leak (>30 GPD) these monitors can be expected to go way upscale, perhaps even saturate; and the shine from the affected generator line will probably result in indications on all three adjacent detectors.

1.3.3 Other RMS

1.3.3.1 Applicable monitors are RU-141; RU-143/144; RU-139/140; RU-4/5.

1.3.3.2 RU-141 monitors activity from the Condenser Air Removal System (CARS); with the Alert Alarm will indicating an activity increase of 4X > normal; the High Alarm will line up the CARS filter and equates to a 1 GPM Tube Leak assuming 1% Failed Fuel. The CARS line inputs into the Plant Vent Stack, upstream of the RU-143/144 Stack monitors.

1.3.3.3 An RU-143/144 alarm may be a result of more than one input (see map on DPTB Page 11).

1.3.3.4 RU-139 A&B and RU-140 A&B are the main steam line monitors located upstream of all Safety's/Dumps/ADVs. They will over-respond initially to N-16 carryover in the steam if the reactor is still critical during a tube rupture phase. They will have a period when release activity is being carried over by the steam but is not seen as it is less than the 1.5 mRem/hr keep-alive source value.

1.3.4 Worst case defaults

1.3.4.1 Should RU-139/140 be inoperable during an actual release the Mesorem SGTR 1% Scenario allows use of built-in default calculations for either an ADV or MSSS release These default values are based on the Steam Generator Tube Rupture Accident Analysis from CESSAR 15.6, and assume 1% Failed Fuel, a 400 GPM primary/secondary leak rate, and a 2 hour release

1.3.5 DOs and DON'Ts

1.3.5.1 Verify with OPS that the CAR Filter is lined up.

- The default value of 95% should be used for iodine removal efficiency unless the Condenser Air Removal filter is unavailable or indications of impaired efficiency exist. Indications would be alarms from the filter bank temperature and pressure sensors in the Control Room. Temperatures of > 265° F indicate impaired filtration; > 625° F indicates a fire in the carbon filter banks; high differential pressure indicates filter loading. Adjustments to the 95% values should be approved by the RPM/RAC based on the STA/TSC Staff information.

1.3.5.2 Adjusting defaults for over conservatism.

- The default value for RCS Hot Leg (210°) reflects the lowest possible vapor value and is not meant to be a reasonable value to use.
- The default steam flows will most likely never be appropriate to use for a 2 hour release scenario. The maximum steam flows possible (100% power) are in the table below - these should be adjusted per the STA and Tech Staff estimates - DO NOT BE RELUCTANT TO MAKE COMMON SENSE ADJUSTMENTS and then DOCUMENT your thought process.

Component @ 100% Power	Maximum Flow in Lbm/Hr
Output of both Steam Generators	1.72E7
Output of one Steam Generator	8.59E6
Fully Open Safety Valve	9.70E5
Fully Open Steam Bypass Control Valve	9.03E5
Fully Open ADV	1.90E6

- The Steam Generators cannot maintain maximum steam flow for anywhere near two hours after reactor trip. The ADVs/Safety's/Steam Bypass Control valves are typically only partially open for short duration periods.

1.3.5.3 Be aware that releases occur below the RU-139/140 threshold level.

- Only activity greater than the 1.5 mRem/hr threshold level of the RU-139/140 inline monitors will be seen via RMS. If it is likely that activity is being released at these lesser levels, a bounding calculation can be done by using the current Meteorological data and running a projection using 1.5 mRem/hr.

1.4 LOCA Supporting Information

1.4.1 This accident scenario models an RCS leak outside of containment;

1.4.2 The "Plant Vent Exhaust Contributors" and "Fuel Building Exhaust Contributors" should be reviewed to ensure the correct release path(s) are being used.

1.4.2.1 Note that a SIAS will route any activity from the lower level Auxiliary Building Ventilation (below 100') through the Fuel Building Essential Filters. This activity will be released via the Fuel Building Stack and monitored by RU-145/146, with the above 100' levels of the Auxiliary Building being released via the Plant Vent Stack and monitored by RU-143/144.

1.4.3 Fuel Building Vent Stack: leakage activity is released through the Fuel Building Vent Stack and monitored by RU-145/146 or FB PASP.

1.4.3.1 An accident involving elevated Fuel Building activity due to a Spent Fuel bundle leak should be modeled under "Fuel Handling Accident" which utilizes a different source term mix is used.

1.4.4 Plant Vent Stack: Leakage activity is released through the Plant Vent Stack and monitored by RU-143/144 or the PV PASP;

1.4.4.1 An accident involving elevated CARS (Condenser Air Removal System) activity should be modeled under "Steam Generator Tube Rupture 1%" or Steam Generator Tube Rupture 100%" which utilizes a different source term mix.

1.4.4.2 Typical sources from Auxiliary Building Equipment include Letdown System leaks, Sample System leaks, Gas Stripper leaks, etc.

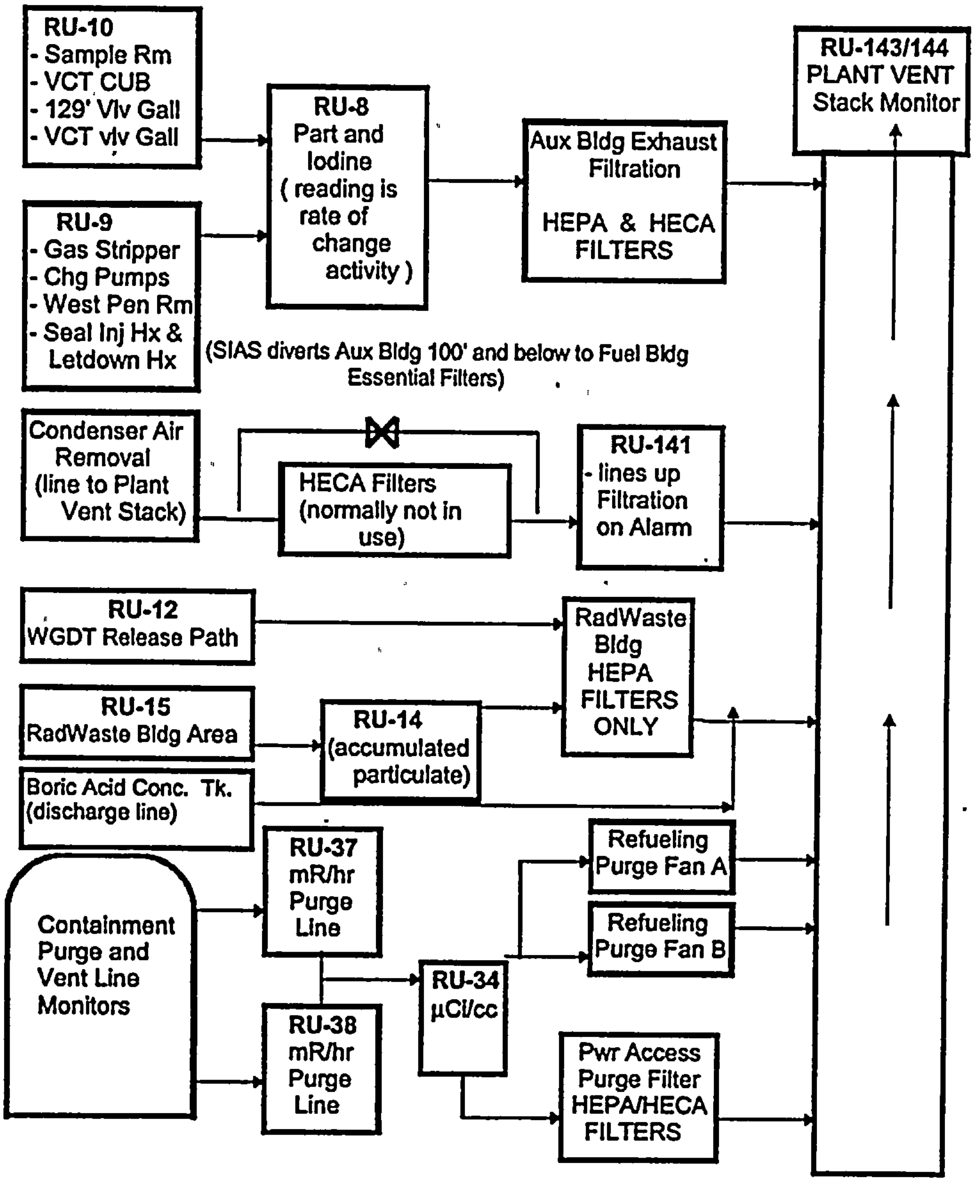
1.4.4.3 The RadWaste Building ventilation exhaust is routed to the Plant Vent Stack. Contributions from the RadWaste Building include the building ventilation, waste gas decay tank discharges and boric acid concentrator discharges. There is no iodine filtration on this release path.

1.4.4.4 An accident involving a Surge Tank or any WGDT which has been isolated for less than 45 days should be modeled as a LOCA 1% to project iodine activity.

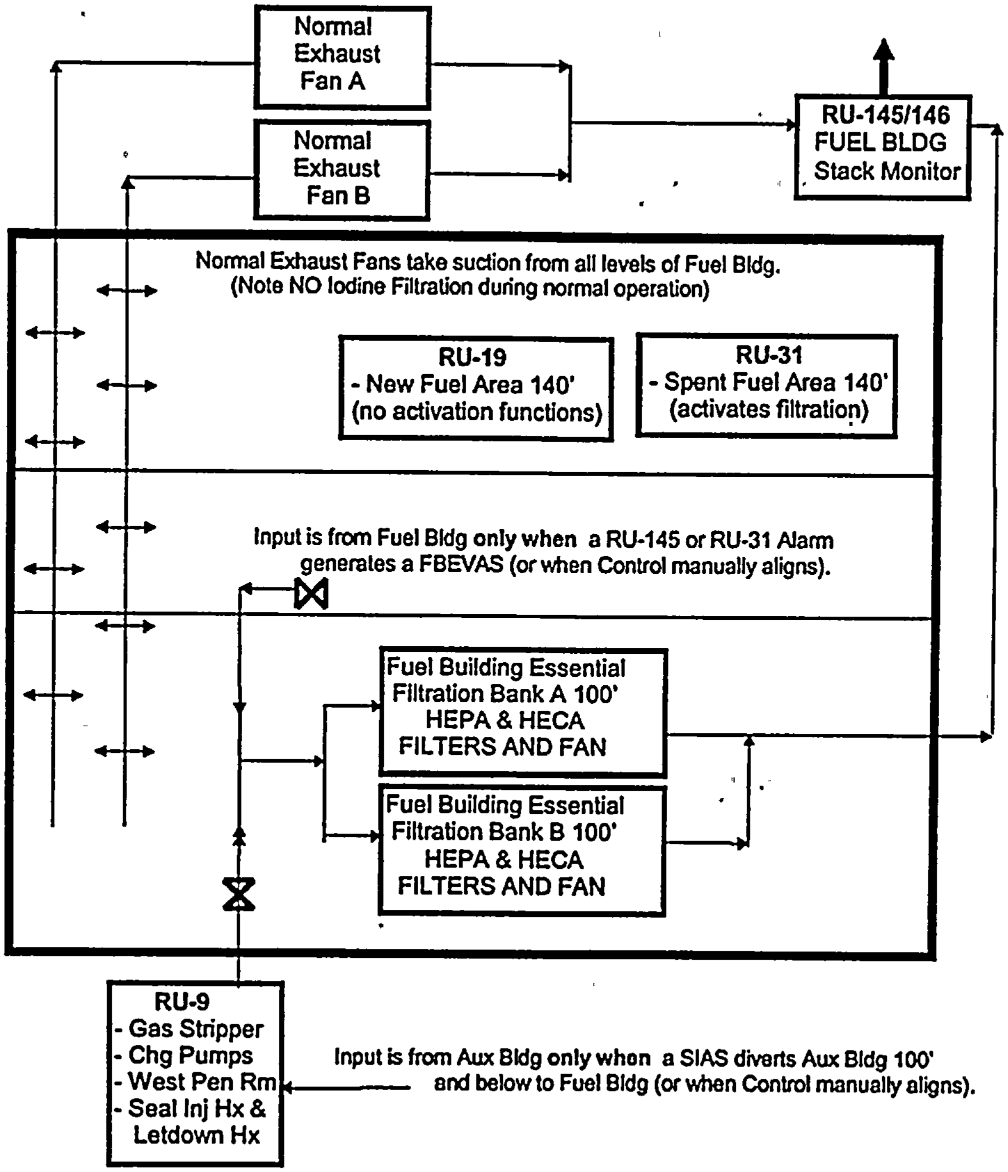
1.4.4.5 A third major source is from the Containment Purge System: a Containment Refueling Purge (non-filtered), a Power Access Purge (filtered) or a Non-Standard Containment Purge (filtered) all release via the Plant Vent Stack.

1.4.4.6 Use of the LOCA 100% accident assumes that an RCS leak has occurred with > 10% cladding failure resulting in significant iodine levels.

1.4.5 Plant Vent Exhaust Contributors



1.4.6 Fuel Building Exhaust Contributors



1.4.7 Basis for Default Ventilation Flow Data

For the Plant Vent	Stack Flow
<u>If fan or pump is running</u>	<u>Maximum rated flow</u>
HAN-J01A (Aux Bldg Normal)	30,000 cfm
HAN-J01B " " "	<u>30,000 cfm</u>
	60,000 cfm total
HRN-J01A (RadWaste Bldg. Normal)	25,500 cfm
HRN-J01B " " "	<u>25,500 cfm</u>
	51,000 cfm total
CPN-J01A (Cnmt.Refueling Purge)	16,500 cfm
CPN-J01B " " "	16,500 cfm
CPN-J02 (Cnmt. Power Access Purge)	<u>2,200 cfm</u>
	35,200 cfm
Condenser Air Removal Pump A	60 cfm
" " " " B	60 cfm
" " " " C	60 cfm
" " " " D	60 cfm
Gland Steam Exhaust Blower	<u>1300 cfm</u>
	1540 cfm total

For Fuel Building Vent	Stack Flow
<u>If fan is running</u>	<u>Maximum Rated Flow</u>
HFN-J01A (Normal)	21,750 cfm
HFN-J01B "	<u>21,750 cfm</u>
	43,500 cfm total
HFA-J01 (Essential)	6000 cfm
HFB-J02 "	<u>6000 cfm</u>
	12,000 cfm total

Default Assumptions

<u>For Plant Vent:</u>

If Refueling Purge is not operating, 1.13E5 CFM would be the Maximum Default.

1.46E5 CFM with Refueling Purge Operating.

<u>NOTE:</u>

The above defaults include 1540 cfm from the Condenser; while the 2200 cfm from the Cnmt. Power Access Purge is not included.

<u>For Fuel Building</u>

43,500 CFM if Normal Fans are operating.

12,000 CFM if Essential Fans are operating.

1.5 Fuel Handling Accident Supporting Information

1.5.1 The accident assumption is that a Fuel Handling accident has occurred releasing activity from a fuel bundle. A Fuel Handling accident is considered to be primarily a noble gas cloud and the mix used by Mesorem reflects this. The immediate concern would center primarily onsite.

1.5.2 The mix assumes that virtually all the released activity will be decayed down to primarily Xe-133 and Kr-85, and that all lodine will be decayed to lodine 131.

1.5.3 Fuel Building

1.5.3.1 The release is postulated to pass through the Fuel Building Essential Filters enroute to the Fuel Building Vent Stack, where it will be monitored by RU-145/146 or the FB PASP (a FBEVAS or manual operation of Essential Filters is required for iodine filtration; iodine filtration lineups and flowrates should always be verified with Operations).

1.5.4 Containment Building

1.5.4.1 Fuel Handling accident; the release is postulated to pass through the 42" Refueling Purge lines enroute to the Plant Vent Stack, where it will be monitored by RU-143/144 or the PV PASP (the containment may be isolated and/or the purge stopped in short order in such a case; if so, the "Isolated Containment" should then be used to project dose at Site Boundary).

1.5.5 SCRAM TIME

1.5.5.1 For the "Has Reactor Been Scrammed?" prompt:

- The answer to the prompt should always be "Y" as the fuel bundle will no longer be critical ("Y" tells the program to start decaying the mix).

1.5.5.2 For the elapsed time since scram prompt:

- The number of hours and minutes since the fuel bundle has been critical should be entered. An accurate entry of hour and minutes will not be immediately available; a conservative default time to use for decay would be the time the reactor was shutdown for the most recent refueling outage (maximum allowable number of hours is 999.00 - hours greater than 168 will have an insignificant impact on the calculation).

1.6 Waste Gas Decay Tank

1.6.1 The accident assumption is that the Waste Gas Decay Tank has been isolated from the gas header and Surge Tank. The release would be through the RadWaste Building HEPA filters and monitored by the Plant Vent Stack RU-143/144 or PASP monitor. Per the UFSAR analysis of a rapid release using maximum inventory, the iodine dose would be 3 mRem or less at Site Boundary; therefore no iodines are projected. For a Surge Tank or any online tank or pathway gaseous release which may contain significant iodine activity (has been isolated for < 45 days) use the " LOCA 1%" scenario.

1.6.2 SCRAM TIME

1.6.2.1 For the prompt "Enter number of hours and minutes since the tank has been isolated ":

- The Shift RadWaste Building Operator will provide the time since the tank has been isolated (if the time is not readily available use the default of 999 hours).

1.7 Unmonitored release

1.7.1 General notes

1.7.1.1 Typical accident assumptions would be that a release is occurring which is not monitored by an RMS monitor, nor is there a flow rate available. There will likely be no indications of release activity initially other than immediate area dose rates. Examples of this type of release would be a ruptured tank in the RadWaste Yard which contained radioactive liquids; an outside fire involving radioactive waste, an accident involving a waste shipment on site, an accident in the Radwaste Storage Building, etc. In all those cases, release rates would typically be relatively low, but the potential does exist for high level releases. Site Boundary dose estimates may have to be developed from available data and provided to ARRA in lieu of a Mesorem projection until actual Site Boundary data is available. The below information may be used to supplement the Dose Projection guidance.

1.7.2 Categorize - Fit the release into one of the below three conditions and follow the direction.

1.7.2.1 Primarily Noble Gas- with neither iodines nor particulates being significant contributors (a ruptured liquid outside storage tank, a fuel handling accident or waste gas tank accident being release through an open roll-up door, breach in wall, etc., a system/tank vent in containment during an outage with outside hatch).

- These can be modeled by using a WGDT (you are fairly certain there is no iodine present) or Fuel Handling accident (if there may be small amounts of iodine being released) selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.2 Noble Gases and Iodines - with particulates not being a significant contributor (a breach in the Aux. Bldg/Fuel Bldg. during LOCA conditions, degassing of a major tank/system volume in containment during an outage with outside hatch open).

- These can be modeled by using a LOCA accident selection.
- Run a projection using current meteorological data. Use RU-145 and enter a low monitor reading along with "0%" filtration. Do not request printout. Compare the "Max" External EDE value with onsite RO-2 Closed Window readings.
- Re-run the scenario and adjust the RU-145 reading to get agreement between the External EDE "Max" reading and the field readings (nominally at .25 miles from source).
- When satisfied with the agreement, obtain a printout and issue a PAR.

1.7.2.3 Primarily Particulates - with noble gas and iodines not being significant contributors (a fire involving compacted waste, resins, etc.).

- Mesorem will be of limited usefulness in this situation. Follow the direction on the next page to obtain an initial PAR.

1.7.3 Particulate Release - The Mesorem Jr. built-in projections will not model a particulate only release. However, the plume "footprint" as developed by Mesorem from current Met data will be useful, and a projection should first be run for this purpose (using any accident scenario). The Chi/Q values generated in this projection will be used to develop Site Boundary dose estimates, per the following methodology.

1.7.4 Plume footprint - Perform a LOCA 1% Mesorem run using actual meteorological data (all other inputs are unimportant at this point). Obtain the printout.

1.7.5 Release Rate - Determine the best estimate of the number of Curies involved in this release per RadWaste paperwork and/or RadWaste Group. Use this total curie number and estimate how quickly the material is being released.

1.7.5.1 Example: a group of 55 Gal Drums is burning. Reviewing the paperwork with RadWaste indicates a total of 12 Curies are involved. Estimates from Fire Protection at the scene indicate they expect the total fire time to be 60 minutes. Assuming that all 12 Curies will eventually be released, the release rate would be 12 Ci/60 Min or 12 Ci/3600 Seconds or 3.33E-3 Ci/Sec.

1.7.6 Dose Conversion Factor - Per the R/W paperwork select a Dose Conversion Factor (from DCFs below). These represent TEDE dose based on annual waste stream sample analysis.

DCF per Waste Category (Rem-M^3/Ci-hr)	Unit 1	Unit 2	Unit 3
Dry Active Waste (*55 Gal Drums*)	4.08E5	8.26E4	1.08E5
Resin Lo Level	2.76E5	7.35E4	7.91E4
Resin Hi Level	8.05E4	6.02E4	5.62E4
Process Filters	1.76E5	3.29E4	5.02E4
Concentrate	3.75E5	1.07E5	6.90E4
Tri-Nuke Filters	2.10E5	5.98E4	5.68E4
Resin Condensate Demins	5.69E4	5.69E4	5.69E4
Resin Blowdown	1.41E5	6.24E4	6.24E4

1.7.7 Then: __________ Ci/Sec (estimated release rate) X _____________ receptor Sec/M3 = ________ Ci/M3 X ____________ Rem-M3/Ci-hr = _______ Rem/hr in TEDE at the receptor.
where: the Sec/M3 is the Chi/Q at the receptor site (normally Site Boundary but may be used for any receptor point) and taken from the Mesorem printout you directed per current Met. data.

1.7.8 Followup actions

1.7.8.1 Expedite efforts to obtain grab samples and detailed dose rate readings (accurate times samples are taken and specific locations of samples and dose rates will be crucial for later reconstruction of release). For tanks, waste shipments, etc., there may be isotopic analysis of contents available, and these should be obtained for Technical Staff use.

1.7.8.2 Direct actions to isolate event onsite with appropriate radiological postings; have word passed as required for protection of Onsite personnel; provide airborne ingestion and inhalation protection for the responding staff in a conservative manner until field samples are available.

1.7.8.3 Fax isotopic information to ARRA as it becomes available; the RASCAL Dose Assessment Program used by ARRA has some options to input particulates which Mesorem does not.

1.7.8.4 Whole Body Count field teams and other selected available personnel who have been in or near the plume. This information can assist in the recreation of the event (e.g., negative results might show no release occurred).

1.7.8.5 Whole Body Count data can be used to determine the skin dose received by an individual in cases where individuals immersed in a plume may have received high noble gas exposures. Such individuals should be brought in and the dosimetry department directed to perform the appropriate body count and analysis.

1.8 Source Term Monitoring

1.8.1 Need to verify source term

1.8.1.1 "The largest single component of uncertainty is expected in the estimate of the source term"; "Dose projections should be viewed only as rough estimates"; "It is apparent that, overall, the best that can be expected early in an accident release sequence is that projected doses may be within a factor of 10 of the doses based on field monitoring; it is likely that they will be less accurate" - these statements are all from NUREG/CR-5247, RASCAL Version 2.1 User's Guide. Radiological Assessment System for Consequence AnaLysis is the USNRC's Dose Assessment Program, and the cautions apply to us as well as them.

1.8.1.2 Training Drills and Exercises are conducted with data that correlates well. This is a necessity if the training is to be effective, although not realistic. Expect to have to make a correlation adjustment in actual conditions.

1.8.2 Initial actions

1.8.2.1 Direct sampling to allow comparisons of actual samples to the Iodine/Noble gas ratios and mixtures used by Mesorem.

1.8.2.2 Ensure that grab samples are obtained from the onsite release source, whether via the stack monitor sampling rig, or by local samples.

1.8.2.3 Verify filtration is in effect and fuel condition assumptions are correct.

1.8.3 Comparison actions

1.8.3.1 RO2/2A Closed Window readings may be compared to the calculated mRem/hr (external EDE) readings at a specific location.

1.8.3.2 The initial Particulate and Iodine µCi/cc values will be radioed in by the field teams (these readings are converted from cpm/min to a gross µCi/cc value based on I-131 equivalent energy). The Iodine cartridge mCi/cc level may be used as a Rem/hr approximation for comparison with the projected Thyroid CDE value at that same point.

1.8.3.3 A worksheet to accomplish the above comparisons follows on the next page.

1.8.3.4 As soon as possible, a centerline sample should be brought onsite for an isotopic analysis. The total µCi/cc from Noble Gases and Iodines may be used by the RAC Staff to back-calculate the source term or determine the external EDE/TEDE ratio.

1.8.4 Corrective actions

1.8.4.1 If the I/NG ratio and mix in Mesorem are close to the actual composition, adjust the Mesorem projection by repeated runs, varying the RMS value until projected data agrees with the field data.

1.8.4.2 If the I/NG ratio and/or the mix need adjustment, obtain the isotopic analysis of the sample that best fits the current situation. Per Section 4.0, page 18, "Running a Projection Using Grab Sample Data" direction, obtain an updated projection reflecting the actual source term. Note that the RMS value entered may not match the activity calculated per the sample. Mesorem will alert you to that fact by pointing out whether the entered RMS value is high or low, and then asking if you want to continue. Continue to obtain a projection based on that specific mix.

1.8.5 MESOREM receptor comparison worksheet

1.8.5.1 As early as possible, verify that the projection is reasonable by comparing actual field results to projected. This worksheet provides a simple way to convert the projected readings to numbers that can be readily compared to field readings. Results and thought processes are to be entered in the formal log for record keeping purposes.

1.8.5.2 Direct the teams to call in closed window (CW) dose rates (equal to external EDE) and a gross iodine µCi/cc based on the frisker reading taken on a air sample silverzeolite cartridge.

1.8.5.3 Make sure the readings used are CENTERLINE (C/L) and are a reasonable time match (if the sample was taken at Site Boundary, and the plume took ~30 minutes to reach Site boundary, then the Mesorem projection used for comparison purposes should have been done about ~30 minutes ago).

1.8.5.4 Comparison

ACTUAL	PROJECTED
Field Reading @ ______ miles	Projected Reading @ ______ miles
CW ______ mR/hr	External EDE ______ mR/hr
Gross Iodine ______ µCi/cc	Projected Iodine ______ µCi/cc

Where "Projected Iodine" is equal to

______ sec/m3	x ______ µCi/sec	^{3} 1 E6	= ______ µCi/cc
(DCHI/Q) from Page 1 MESOREM print-out; additional distances require setting a DYNAMIC Receptor at that field location for the projection.	(Release Rate) from Page 4 MESOREM print-out; use the I, not NG, release rate (same release rate applies to all distances).	Conversion constant (µCi/m3 to µCi/cc)	The Projected Iodine per MESOREM, Jr.

1.9 External EDE/TEDE Ratios

1.9.1 Need for ratios

1.9.1.1 An immediate need as Onsite and Offsite Field Teams are dispatched is to provide the teams with TEDE dose limits (EPA guidance and recommendations on dose limits for workers during emergencies is detailed in Appendix K - Emergency Exposures and KI) and a means to remain within those limits using only SID and dose rate meter readings (external EDE values).

1.9.1.2 In addition, in severe accidents the Thyroid CDE dose needs to be monitored for KI administration (if > 25 Rem).

1.9.2 TEDE Dose

1.9.2.1 As calculated by Mesorem and per EPA guidance TEDE is the external EDE dose summed with the CEDE dose. Determine the TEDE Dose limit to be applied for each Field Team (per a review of section Appendix K - Emergency Exposures and KI).

1.9.3 Lo CEDE Dose

1.9.3.1 In releases which are primarily Noble Gas with minimal Iodine levels (low CEDE value) the ratio of external EDE to.TEDE will approach "1" and no correction to the SID reading will be required. Determine desired TEDE Limit for each team and direct them to use un-corrected SID Dose to remain within that limit.

1.9.4 Hi CEDE Dose

1.9.4.1 In releases with significant iodine levels, the CEDE will become larger and the ratio of the SID reading (external EDE) to TEDE will become less than one. Per EPA recommendations in such cases, the TEDE dose limit should be ratioed down to provide effective TEDE dose control via control of External EDE. Determine desired TEDE Limit for each team and determine the working SID Dose to remain within that limit per below direction.

1.9.5 EDE/TEDE calculation

1.9.5.1 An initial external EDE/TEDE ratio using the Mesorem projection data can be done, remembering that it is critical that the data is selected for the distance from the Site that the Field Team will be operating. Use the "MAX" distance value (the .25 mile data from page one on the printout) for Onsite Teams. As soon as actual field data becomes available the ratio should be checked and updated.

$$\text{ratio} = \frac{\text{external EDE}}{\text{TEDE}}\quad \begin{array}{l}\text{(value from page 1 of the Mesorem printout in mR/Hr)}\\ \text{(value from page 1 of the Mesorem printout in mR/Hr)}\end{array}$$

other values available via PAR Receptor information

1.9.6 Working Limit

1.9.6.1 Multiply the desired TEDE limit for that person or Team by the ratio above; issue the reduced working limit in mRem.

1.9.7 Thyroid CDE Dose Control

1.9.7.1 Determine an appropriate expected Thyroid dose for each Field Team using the Mesorem page 1 projection data initially (dose rates assume C/L exposure for 1 hour). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.2 If the potential Thyroid dose approaches 25 Rem, consider ways to reduce dose; if necessary issue KI (Potassium Iodide). Refer to Appendix K - Emergency Exposures and KI.

1.9.7.3 As soon as actual field data becomes available the expected dose should be checked and updated.

1.9.8 Thyroid CDE from field readings

1.9.8.1 Frisker readings converted to µCi/cc Iodine equivalent can be used to generate an estimated Thyroid CDE rate in Rem/hr from a field sample. Or, the Gross Iodine activity from a completed analysis on that sample may also be used for estimates.

1.9.8.2 Methodology - Multiply the air sample charcoal frisker reading or the total iodine activity from the isotopic analysis (in µCi/cc) times the appropriate conversion factor (in Rem-cc/hr-µCi). Note that the 100% factors are less than the 1% factors due to mix differences.
Sample taken at ____ miles from Site @ ____ degrees from "0" degrees North
Sample taken @ _______ Time on ___________ Date

____________ µCi/cc X __________ $\frac{\text{Rem-cc}}{\text{hr-µCi}}$ = __________ Thyroid CDE in Rem/hr

1.9.9 Rem-cc/hr-µCi - When Effective Age falls between 2 listed numbers, use the higher age. Select 1% failed fuel unless plant conditions indicate severe (>10%) fuel cladding failure.

Receptor Effective Age (hrs)	1% Failed Fuel	100% Failed Fuel
0-4	6.0 E 5	3.5 E 5
>4-10	7.0 E 5	5.0 E 5
>10-24	9.0 E 5	7.0 E 5
>24	1.1 E 6	1.0 E 6

1.9.10 Application - Note that this methodology can be used Onsite and Inplant as well as for Offsite teams to estimate initial exposure and provide conservative controls. Detailed individual exposure tracking utilizing normal Site procedure should be initiated as soon as practical.

1.10 Mesorem Jr. Specialized Functions

1.10.1 USE OF "COMMAND MENU" OPTIONS

1.10.1.1 F1 - Update Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Update" allows changing the data similar to redoing a projection, and is usually faster. The projection will then have to be run again; see following instructions on Execute Dispersion Model. Note that redoing the entire projection from the "Execute Dispersion Model" selection will accomplish the same result and may be the simpler approach.

Additional options available are:

1. "F1-Meteorology Data File" allows you to enter precipitation (in/hr) if desired; the precipitation rate is available as a 15 minute rate or as an hourly total on the line printer at the Met Tower. Send an I&C Tech out to obtain the in/hr data.

2. "F5-Receptor Data File" allows you to review the entire list of receptors; or to add, update/display or delete existing receptors. This option is useful to match field data more exactly to a projection; and to calculate a PAR for a specific point not on the receptor list.

1.10.1.2 F2 - Execute Dispersion Model: offers two choices, "F1 - Fast Mode A and update from sequential screens" or "F2 - Mode A and execute model from edited files". "F1" is the normal mode. Use "F2" to run a projection after the files have been edited using the above "Update" selection.

1.10.1.3 F3 - Mode Selection [A or B]: Mode A is always used in the Units and to provide PARS in the EOF; Mode B can be used with the assistance of the Eplan Coordinators if desired.

1.10.1.4 F4 - Display Data: the data entered from the last projection performed is stored in 5 data files (F1-Meteorology, F2-Effluent, F3-Model parameters, F4-Isotopes and F5-Receptors). Selecting "Display" allows reviewing the data without the risk of inadvertently changing it.

1.10.1.5 F5 - Back-calculate Source Term: selecting this allows two options "Press A to select the external EDE/TEDE ratio" or "Press B to select Back-calculation of source term". See page 25 for specific direction on these options.

1.10.1.6 F6 - Graphic Display: This selection graphically depicts the plume over a map of the 10 mile EPZ. Selecting this option will allow graphing four different overlays: F1 - External EDE Rate (Immersion) F2 - Adult Thyroid CDE Rate (Inhalation), F3 - Iodine Deposition and F4 - CHI/Q Values.

- The legend supplied with the graph provides the data for the three segments the plume is divided into. The inner segment is provided with one value indicating the peak activity; the next two segments have two values indicating the inner and the outer edge values for that segment; and the "blue" values provided indicate the rates outside the plume and up to it.
- An "ETA" value (Estimated Time of Arrival) gives the time it will take for the plume to reach the 10 mile boundary using the projection wind speed and the assumption that the release has just begun.
- Use the "F2 - Plot" choice to obtain a printout; Use the "F1 - Menu" to exit to the menu. As the wind conditions change a series of graphs should be run and kept as ongoing records of areas potentially contaminated. This will aid the recovery phase.

1.10.1.7 F7 - Password Utility: Used by Emergency Planning Group to set password.

1.10.2 USE OF "RECEPTOR DISPLAY MENU" OPTIONS

1.10.2.1 F1 - External EDE Rate (Immersion): gives the external EDE from plume shine (does not include 4 day deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.2 F2 - Adult Thyroid CDE Rate (Inhalation): gives the Thyroid CDE Rate for all receptors within the designated sectors (normally three).

1.10.2.3 F3 - TEDE Rate (Inhalation): gives the TEDE based on inhalation only (no deposition dose); for all receptors within the designated sectors (normally three).

1.10.2.4 F4 - Protective Action Recommendations and Guides: starts with Site Boundary PAR data as listed on page 2 of the Mesorem printout; then provides PAR Data for all receptors (a review of the following complete receptor list to determine receptors of interest should be done prior to using this option as it is time consuming to scroll through the screens and you cannot scroll back).

- Each receptor will be given Shelter and Evacuation TEDE and TODE dose. The TEDE Dose includes the Inhalation and the 4 Day Deposition Dose for both the Shelter and Evacuation PARS. The Evacuation Dose will therefore be conservative. The minimum or "no dose" value provided will be shown as "< .02" and recommendations will be made as appropriate, including KI Administration.

- The Plume Arrival time in hours is given for each receptor. The time given assumes the release

- May be added as necessary per the "Update Data" option (guidance is on page 2 of this Appendix).

1.10.2.5 F5 - Iodine Deposition Rate: Provides the iodine deposition rate in µCi/m3-sec for all receptors within the designated sectors (normally three). This information will be useful to ARRA and dairy farms in high deposition areas are of particular interest.

1.10.2.6 F6 - CHI/Q Values: Provides the CHI/Q (sec/m3) value for all receptors within the designated sectors (normally three).

1.10.2.7 F7 - Receptor Locations: Provides the same information as the following complete receptor list.

1.10.2.8 Q - Leave Receptor Display Menu: READ THIS PROMPT CAREFULLY!! Selecting "Q" from the Receptor Display Menu will provide the prompt "Do you wish to perform another forecast [Y/N]" ONLY ANSWER "Y" when you are ready to delete the current projection data and start a new projection (begin again). IF YOU WANT TO CONTINUE WORKING WITH THE CURRENT PROJECTION DATA, REVIEW RECEPTOR DATA, PRINT GRAPHS, ETC. enter "N".

1.10.3 PARs for all receptor locations

1.10.3.1 Shelter Dose values and Evacuation Dose values for TEDE and TODE are calculated for about 175 receptor locations beyond the Site Boundary. Although Mesorem automatically reports only the Site Boundary PAR and associated Data on the screen or printout, the additional receptor data can easily be obtained.

1.10.3.2 The complete list of receptor locations is included in this section (they may also be reviewed by selecting "Receptor Locations" on the Receptor Display menu).

1.10.3.3 The Shelter Dose and Evacuation Dose TEDE and TODE values, the Plume Arrival Time, along with the Protective Action Recommendations (including stable iodine administration), may be obtained for any of these receptors by selecting "Protective Action Recommendations and Guides" on the Receptor Display menu.

1.10.4 Receptor display

1.10.4.1 The Receptor Display menu is obtained 3 ways:

1. It appears following the output of a single projection, once one answers "No" to the question "Will this be a simultaneous release?"

2. It appears following the output of a simultaneous projection, once one answers "No" to the question "Do you want to consider other release points?"

3. If back at the Command Menu, select "Display Data", then select "Receptor Data File" on the File Menu.

1.10.4.2 Scrolling - Note that Mesorem Jr. will scroll in order through all the receptor sites starting at Sector "A" and that you cannot scroll back! If you miss the ones you need you will have to start over. Review the following list to be aware of when points will be coming up.

1.10.5 Additional receptors

1.10.5.1 Should none of the existing receptor locations serve the need, one of the "dynamic" receptors (having designation "DY01 thru DY24") may be used for the needed location:

- Select "F1 - Update Data" on the Command menu; then
- Select "F5 - Receptor Data File" on the File menu; then
- Select "F2 - Update/Display a Receptor" on the Receptor Utilities menu
- Use one of the "DY" numbers and enter the required data (note that the "angle" called for is a compass heading from PVNGS to the receptor location desired; where Sector "A" centerline is 0°, and Sector "E" centerline is 90°, etc).
- Once this is done, Mesorem Jr. will calculate doses for the new receptor location.

1.10.5.2 Note that the "Dyxx" Receptor Data will always appear at the end of the receptor display list rather than be placed in the appropriate sector with the permanent individual receptors.

1.10.5.3 List of Receptors

RECEPTOR NAME	DIRECTION	ANGLE (deg)	DISTANCE (mi)	COMMENTS
Site Boundary "A"	N	000.0	00.60	SB, 2, 5, 10,15,20,30,40,50 distances
SC02	N	000.0	07.00	Ruth Fischer School
Site Boundary "B"	NNE	022.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "C"	NE	045.0	01.58	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "D"	ENE	067.5	01.37	SB, 2, 5, 10,15,20,30,40,50 distances
FM05	ENE	075.0	09.00	J.A. Woods Farms
DA04	ENE	071.9	11.62	Stotz Dairy Farm
DA05	ENE	071.9	11.61	Crosswinds Dairy
DA14	ENE	070.6	26.48	Advantage Farms
DA15	ENE	070.4	25.82	Eyherabide I
DA28	ENE	069.6	30.74	La Salvia, Jerome
OF03	ENE	066.0	35.00	APS El Mirage Office
DA16	ENE	081.4	21.37	Van Leeuwen, G.
Site Boundary "E"	E	090.0	01.34	SB, 2, 5, 10,15,20,30,40,50,60 distances
70E	E	090.0	70.00	Apache Junction
85E	E	090.0	85.00	E of Apache Junction
RS01	E	086.0	03.00	Adams Residence
OF01	E	097.0	15.00	APS Buckeye Office
OF02	E	084.0	30.00	APS Goodyear Office
FM03	E	088.0	15.00	Cambron Farm
FM04	E	095.0	09.00	Cooley Farms
DA01	E	092.6	11.06	A&H Dairy
DA02	E	087.3	10.72	Butler Living Trust
DA03	E	086.1	11.07	B&K Dairy
DA06	E	100.0	12.84	Kerr, William
DA07	E	087.4	17.31	Dickman Dairy
DA08	E	087.4	17.31	Eyherabide II
DA09	E	092.3	19.86	Kerr, David Dairy
DA10	E	093.4	20.04	Kerr, John W. Jr.
DA11	E	092.4	19.22	Lamcrest Enterprises
DA12	E	093.6	19.25	Tumbleweed Dairy
DA13	E	093.4	20.20	Hillcrest II
DA17	E	084.9	22.66	Desert View Dairy
DA18	E	088.8	23.69	Bolle & Henry Dairy
DA19	E	089.0	23.69	Heartland VI
DA20	E	092.2	20.82	Triple J (J. Kerr)
DA21	E	095.7	20.91	Dykstra Dairy
DA22	E	093.4	21.81	Botma, Randy
DA23	E	095.0	23.14	T&K Investments III
Site Boundary "F"	ESE	112.5	01.28	SB, 2, 5, 10,15,20,30,40,50 distances
SC01	ESE	105.0	11.00	Palo Verde School
RS02	ESE	106.0	04.00	Wedgeworth Residence
FM01	ESE	122.0	05.00	Desert Farms
DA25	ESE	104.1	22.28	Rainbow Valley North
DA26	ESE	104.1	22.28	Rainbow Valley South
DA24	ESE	100.6	21.66	Kuiper, Darrell
DA27	ESE	106.23	23.00	Western Sky Diary
Site Boundary "G"	SE	135.0	01.31	SB, 2, 5, 10,15,20,30,40,50 distances
SC03	SE	144.0	08.00	Arlington School
Site Boundary "H"	SSE	157.5	01.88	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "J"	S	180.0	01.68	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "K"	SSW	202.5	01.14	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "L"	SW	225.0	00.75	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "M"	WSW	247.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "N"	W	270.0	00.62	SB, 2, 5, 10,15,20,30,40,50 distances
SC04	W	281.0	22.00	Harquahala Valley School
Site Boundary "P"	WNW	292.5	00.63	SB, 2, 5, 10,15,20,30,40,50 distances
Site Boundary "Q"	NW	315.0	00.74	SB, 2, 5, 10,15,20,30,40,50 distances
MO2	NW	323.0	09.00	MacArthur's Farm
Site Boundary "R"	NNW	337.5	00.83	SB, 2, 5, 10,15,20,30,40,50 distances
DY01-DY24	Variable	Variable	Variable	Available Dynamic Receptors

1.10.6 Back-calculating source term - Use of the F5 - Back-calculate Source Term? Selecting this will provide the "A" and "B" options on the Command Menu as follows:

1.10.6.1 OPTION "A" - Used to adjust specific area EDE/TEDE ratios. If Noble Gas and I/NG µCi/cc Iodine field air sample data in gross µCi/cc become available the "Press A to select the external EDE/TEDE ratio" option may be used. This option is of limited early use as Noble Gas Isotopic values are required.

- The prompts will be for (a) the noble gas and iodine levels in gross µCi/cc (an MCA analysis will be required for noble gas although gross iodine activity will be available from field frisker readings); (b) the distance the sample was taken in miles from Site; and (c) the angle the sample was taken in relation to "0" degrees North. Note that samples taken outside the sectors used in the projection will not be accepted.
- The completed calculation provides comparison between the actual and the projected air sample data at that point (in gross µCi/cc) as well as a specific external EDE/TEDE ratio for that sample area. Use the updated ratio for that team and make adjustments to the team dose limits as appropriate. Thyroid CDE will also be provided.

1.10.6.2 OPTION "B" - Use to develop data to update the source term: As the initial Field Team dose rates become available (closed window mRem/hr at a known distance from Site center and the angle between the field dose rate and "0" degrees North) they may be entered into Mesorem via the "Press B to select Back-calculation of source term" option. This option will be of use during the early event phase as field dose rates will be the first information available defining the plume.

- The prompts will be for the field reading in mRem/hr (closed window); then the distance in miles from Site; and the angle the reading was taken in relation to "0" degrees North (Note that readings found outside the sectors used in the projection will not be accepted).
- The completed calculation provides the projected versus actual field reading at the same point for comparison; as well as projected and adjusted release rates. Several field samples should be collected prior to source term adjustment which is then done by repeated Mesorem Jr. runs until a "best fit" of the accumulated data is obtained.

1.10.7 Running a projection using grab sample data

1.10.7.1 Run projection as normal until the "Breakdown Menu" display appears - select: F1 - Grab Sample Analysis Complete: isotopic data from a stack or field sample is available, and the projection will be calculated based on a corrected mix per the grab sample activity.

- The prompt "Do you wish to utilize current isotopic mix?" may appear after you choose one of the following selections. The question is only asked after the initial projection in a series of projections has been run; and allows you to keep the current mix - (Y) - if you want to keep the current mix, or - (N) - if you want to change the current mix.

- Although the isotopic sample data entered will be used in this choice to calculate a projection dose, the program still prompts for an RMS reading. Reason: the monitor reading entry is used by Mesorem to calculate a comparison source term when you elect to change the mix concentrations or the release rates. After the mix concentrations or release rate data is entered and before the printout is done, Mesorem will display a message indicating whether the updated source term will be > or < than the source term the RMS reading would provide. The program will then ask if you want to continue the projection using the entered concentrations. This comparison provides the ability to work up a release per a specified mix that equates to a specific RMS monitor reading, via multiple backfit calculations. Normally you will enter "Y" to continue the projection.

1.10.7.2 Data entry - The program prompts for the entry of the RMS monitor information, process flow rate and filter efficiency. Answer the prompts. The "Isotopic Mix Menu" appears. On the "Isotopic Mix Menu," three choices are offered:

1. F1 enter isotopic grab sample activity by % of total. Enter the % abundance for the five iodine isotopes, followed by the 13 noble gas isotopes; remembering each group must total 100.

2. F2 enter sample activity in μCi/cc concentration by isotope. Enter the μCi/cc concentration for each isotope - the μCi/cc units are not noted, but that is the format to be used.

3. F3 enter sample activity in release rate by isotope. Enter the μCi/sec release rate for each isotope <u>not</u> μCi/cc.

1.10.7.3 Sample decay - For the "Enter the time that the sample was analyzed" prompt, be aware that the DECAY completed analysis will already have been decay corrected back to the sample collection time. Enter the time between reactor scram and sample collection; or "00:00" if reactor was critical at sample collection time.

1.10.7.4 Finish projection - Step through the remaining steps and the new calculation will reflect the updated mix.

1.10.8 Technical Basis Information

1.10.8.1 MESOREM, Jr. developmental references

1. EPA 400-R-92-001, "Manual of Protective Action Guides And Protective Actions for Nuclear Incidents," October 1991
2. EPA 520/1-88-020, "Federal Guidance Report No. 11 Limiting Values of Radionuclide Intake and Air Concentration and dose Conversion Factors for Inhalation, Submersion, and Ingestion," U.S. Environmental Protection Agency, 1988.
3. Reg Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I."
4. NUREG/CR-3344 (PNL-4753), "MESOI Version 2.0: An Interactive Mesoscale Lagrangian Puff Dispersion Model with Deposition and Decay," Pacific Northwest Laboratory, 1983.
5. NUREG/CR-2858, "PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations," November 1982.
6. NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", November 1980.
7. MESOREM, Jr. Background Materials, Program Documentation, Source Code, Programmers Manual, Software Validation Report, Site Verification, and Mesocode Book of Changes on file in the Emergency Planning Department.

1.10.8.2 Some basic information

- All releases are at ground level.
- The stability class is determined using a Delta T from the 35' and 200' Met tower readings.
- The FSAR isotopic mix values for 1% and 100% "Failed Fuel" LOCA and 1% and 100% SGTR are used as conservative for dose projections.
- Mesorem Jr. Chi/Q values are from Desert dispersion parameters as referenced in NUREG/CR-2858.

1.10.8.3 Projection type - In Mode "A", a straight line Gaussian plume projection is calculated and decay corrected doses are provided for the Site Boundary; 2, 5 and 10 mile distances.

1.10.8.4 Release rate determination - A Mesorem calculation is based on Site RMS indications. The current uCi/cc concentration per the release stack Noble Gas Monitor is input along with the flow through that release point. These are converted to a Noble Gas release rate; and the Iodine release rate is then calculated using the FSAR I/NG mix ratios. Iodine filtration efficiency is assumed to be 95% but may be entered as less if needed.

1.10.9 Definitions/Miscellaneous

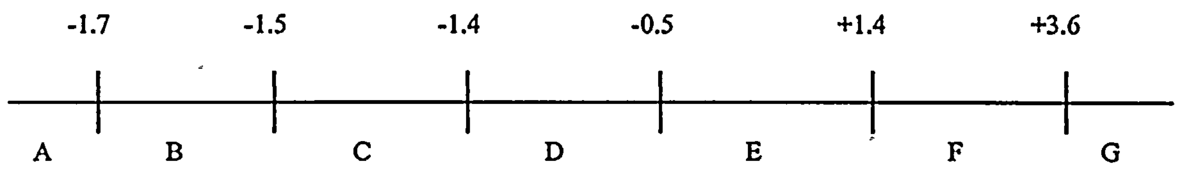
1.10.9.1 Meteorological tower data - The Site Meteorological Tower data needed for dose projection is available on ERFDADS; if the ERFDADS data is unavailable, there are two alternative sources of data prior to falling back on the "default" data entered into Mesorem Jr. The alternative choices should always be used if time permits.

- Choice 2: call the National Weather Service (602-379-4609 or 602-379-4611). They can provide Wind Speed, Wind Direction and Temperature based on information from the tower in the onsite SRP Switchyard area. Use that data to determine an appropriate delta "T" from the table below.
- Choice 1: send an Operator, I&C Tech or RP Tech out to the Met Tower to obtain the data locally: (keys to the tower area are available in Unit 1 and each RFAT).

1.10.9.2 Stability Classification - The delta T is calculated per the below formula in MESOREM Jr.

delta T in °F

If the delta T falls exactly on a number, use the class to the left.



1.10.9.3 The "Default" delta T entered in Mesorem Jr. is a +18 or "G" which is extremely stable but very overconservative in most cases. Therefore, if the Met Tower is unavailable and data can be obtained from the National Weather Service, a better stability class estimation can be used based on wind speed and time of day. Select the appropriate value from the table below and enter as "delta T" for Mesorem projections.

Alternative Delta "T" values for use with NWS Data

Wind Speed (mph)	Day (light)	Night (dim or dark)
<4	-1.6	+4
4-7	-1.4	+2
7-9	-1.4	+1
9-13	-1	-1
>13	-1	-1

References for above table are NUREG/CR-5247 (ORNL-6820) Vol.1, Rev. 2, "RASCAL Version 2.1 User's Guide", December 1994; and Turner, D.B. 1969, "Workbook of Atmospheric Dispersion Estimates". U.S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

1.10.9.4 Topography - Mesorem Jr. calculations include factoring in terrain elevation as the plume travels downwind. As the terrain heights vary smoothly within the 10 mile EPZ this is an un-noticed factor for the most part. At 306° to 309° however an initial rise to the Buckeye Hills begins at around the 8 - 10 mile distance. Because of this rise a plume modeled in that direction will show increased doses at 10 miles as compared to 5 miles, as the plume will be nearer to ground level at that distance. Because of this effect, be aware that dose will not always decrease with distance. Significant receptor sites should be looked at using the Receptor Display Menu or by using one of the Dynamic receptors (section 1.10.1).

1.10.9.5 Emergency Plan meter source check and calibration methodology.

- The Emergency Plan instruments are calibrated every 6 months by Cal Lab; source checked quarterly by the Cal Lab or RP Central; and checked for meter deflection with the button source to use.

- On removal of a meter from a kit for emergency use, the calibration sticker should indicate that calibration has been performed within the last 6 months. The white instrument response check record should indicate the full response check as being done within the last quarter. THE RESPONSE CHECK STICKER WILL NOT BE UPDATED EVERY MONTH AS ON THE UNIT METERS. DO NOT CHANGE THE STICKER as that will remove documentation of the full source check done.

- This methodology is used, as the sources to do the full required response check are not available at all of the Eplan Kits. Meters used in an actual event to determine protective dose rates will be taken to the Cal Lab after the event to have a followup source check done.

- The button source which is available in each kit is used to check for meter deflection on first use of the meter. A log entry indicating that sticker dates have been checked and deflection checks done should be made. A Tech should be assigned to do this initially on facility activation.

1.10.9.6 Definitions

- CDE - The Committed Dose Equivalent. In MESOREM, Jr. it is the dose equivalent to the thyroid that will be received from the inhalation of radioiodine in the plume by an adult during the 50-year period following the intake. In Mode B it includes particulates other than iodine.

- CEDE - The Committed Effective Dose Equivalent. In MESOREM, Jr. it is the sum of risk-weighted CDEs to the various organs or tissues of the body from the inhalation of radioiodine in the plume. In Mode B it includes particulates other than iodine.

- DDE - The Deep Dose Equivalent. This is an NRC term, required for 10CFR20 compliance in substitution for the internationally-accepted external EDE. DDE applies to external whole-body exposure, that is uniform irradiation from an external source, and is the dose equivalent at a tissue depth of 1 centimeter (1,000 mg/cm2).

- EDE - The Effective Dose Equivalent. In MESOREM, Jr., external EDE printouts are for external exposure due to plume immersion. Mode A PAR calculations also include external EDE from iodine deposition. Per NUMARC guidance, the external dose equivalent (which is directly measurable) is an appropriate substitute for external EDE and puts an upper bound on the 10CFR20 quantity "Deep Dose Equivalent" ("DDE").

- SDE - The Shallow Dose Equivalent. For the purposes of this paper it is the dose equivalent to the skin, from external exposure, at a tissue depth of 0.007 centimeters (a density-thickness of 7 milligrams per square centimeter).

- TEDE - The Total Effective Dose Equivalent, the sum of external EDE plus CEDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE in MESOREM Jr. is from immersion only.

- TODE - The Total Organ Dose Equivalent, the sum of external EDE plus thyroid CDE. Except for Shelter Dose and Evacuation Dose PAR calculations, the external EDE component in MESOREM, Jr. is from immersion only. By NRC definition, TODE only applies to the organ receiving the highest dose; excluding particulate releases, for PVNGS' credible accidents this organ is the thyroid.

1.10.9.7 Shelter Dose - Shelter Doses are due to external exposure from plume immersion, committed internal dose from plume inhalation, and 96-hours of external exposure from that ground deposition which is projected for the projected plume duration; each of these components of dose increases with increased Release Duration. The 96-hour ground shine contribution is specified in EPA 400.

- The first results summary screens or pages of Mesorem Jr. output give external EDE rate in mRem/hour at Site Boundary and at 2-, 5-, and 10-miles; this is external EDE due to plume immersion only.
- The complete external EDE component (i.e., plume immersion and ground shine) of Shelter Dose TEDE and Shelter Dose TODE is calculated within Mesorem Jr. and is included in the PAR summary output of TEDE and TODE. The Site Boundary PAR output is automatic.
- Shelter Dose TEDE is calculated by multiplying the centerline Shelter Dose TEDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose TODE is calculated by multiplying the sum of the external EDE rate due to immersion and the thyroid CDE rate for the specified receptor location by the release duration and then adding external EDE from 96 hour exposure to ground deposition of iodine. Shelter Dose thyroid CDE is calculated by multiplying the thyroid CDE rate for the specified receptor location by the release duration.
- No credit is taken in MESOREM, Jr. for shelter Dose Reduction Factors (DRFs of 1 are used); one may view shelter dose as the dose received by individuals in the plume center with no shelter.

1.10.9.8 Evacuation Dose - Evacuation Doses are due to external exposure from plume immersion and committed internal dose from plume inhalation. Ground deposition is not really involved, but is included in MESOREM, Jr. This is equivalent to the EPA 400 provision for use of "Combined Pathway" Dose Conversion Factors.

- The Plume Exposure Time is the Evacuation Time Estimate (2.9 hours for normal weather, 3.3 hours for adverse weather conditions) minus the Plume Arrival Time to the receptor site. Plume Exposure Time used in Evacuation Dose projections made via MESOREM, Jr. will not exceed the Evacuation Time Estimate (2.9 hours or 3.3 hours).
- The Plume Arrival Time is the sum of Plume Travel Time (upwind distance from receptor to release point, divided by wind speed) plus Time Until Release Begins (set equal to zero if release has begun). That is:
- Plume Exposure Time
- Evacuation Time - Plume Travel Time - Time Until Release Begins
- Both Plume Exposure Time and Evacuation Time begin at the time of the dose projection.
- This equation is not applicable to Shelter Dose projections; in Shelter Dose projections Plume Exposure Time is equal to Release Duration and has a user-specified value.)
- When the Evacuation Dose receptor location is already in the plume, Plume Travel Time will be zero, Time Until Release Begins will also be zero, and projected Plume Exposure Time will equal the Evacuation Time Estimate. Plume Exposure Time can be zero; MESOREM, Jr. will show <0.02 mrem Evacuation Doses for such locations, while still recommending evacuation when appropriate, even when Plume Exposure Time = zero at the Site Boundary.
- Evacuation Doses are determined by Plume Exposure Time:
- The TEDE Evacuation Dose is the 4-day external EDE from deposition plus the product of the TEDE rate multiplied by the Plume Exposure Time.
- The Thyroid CDE Evacuation Dose is simply the thyroid CDE rate multiplied by the Plume Exposure Time.
- The TODE Evacuation Dose is the 4-day external EDE from deposition plus the product of the sum of the thyroid CDE rate and the external EDE rate due to immersion multiplied by the Plume Exposure Time.

Appendix S - Abbreviations

1.0 ABBREVIATIONS

ACAD - Automatic Control Access Device
ADV - Atmospheric Dump Valve
AgX - Silver Zeolite
ALARA - As Low As Reasonably Achievable
AO - Auxiliary Operator
ARRA - Arizona Radiation Regulatory Agency
ASCII - American Standard Code for Information Interchange
CARS - Condenser Air Removal System
CAS - Central Alarm Station
CC - Cubic Centimeter
CDA - Core Damage Assessment
CDE - Committed Dose Equivalent
CET - Core Exit Thermocouple
CFR - Code of Federal Regulations
Ci - Curie
CRS - Control Room Supervisor
CSF - Critical Safety Function
CTMT - Containment
CW - Closed Window
DAC - Derived Air Concentration
DAT - Digital Audio Tape
DCF - Dose Conversion Factor
DDE - Deep Dose Equivalent
EAL - Emergency Action Level
EC - Emergency Coordinator
ECC - Energy Control Center
ECL - Emergency Classification Level
EDE - Effective Dose Equivalent
EDG - Emergency Diesel Generator
EOF - Emergency Operations Facility
EOP - Emergency Operating Procedure
ENS - Emergency Notification System
EPA - Environmental Protection Agency
ERDS - Emergency Response Data System
ERFDADS- Emergency Response Facility Data Acquisition and Display System
ESF - Emergency Safety Features
FBEVAS - Fuel Building Essential Ventilation Actuation Signal
FPB - Fission Product Barrier
FTS - Federal Telecommunications System
GE - General Emergency
GPD - Gallons Per Day
GPM - Gallons Per Minute

H2	-	Hydrogen
HDD	-	Hard Disk Drive
HECA	-	High Efficiency Charcoal Assembly
HEPA	-	High Efficiency Particulate Assembly
HPID	-	Health Physics IDentification
HPSI	-	High Pressure Safety Injection
I	-	Iodine
IC	-	Initiating Condition
KI	-	Potassium Iodide
LAN	-	Local Area Network
Lbm	-	Pounds Mass
LCO	-	Limiting Condition for Operation
LOAF	-	Loss Of All Feed
LOCA	-	Loss Of Coolant Accident
LPSI	-	Low Pressure Safety Injection
μCi	-	MicroCurie
MMI	-	Man-Machine Interface
MPH	-	Miles Per Hour
mRem	-	MilliRem
MS-DOS	-	MicroSoft Disk Operating System
MSSS	-	Main Steam Support Structure
MSSV	-	Main Steam Safety Valve
MST	-	Mountain Standard Time
MW	-	MegaWatt
NAN	-	Notification Alert Network
NG	-	Noble Gas
NPSH	-	Net Positive Suction Head
NRC	-	Nuclear Regulatory Commission
NUE	-	Notification of Unusual Event
NUMARC	-	Nuclear Management and Resource Council, Inc.
NWS	-	National Weather Service
OBE	-	Operating Basis Earthquake
OCS	-	Operations Computer Systems
ODCM	-	Offsite Dose Calculation Manual
OSC	-	Operations Support Center
OW	-	Open Window
PAG	-	Protective Action Guide
PAR	-	Protective Action Recommendation
PASP	-	Preplanned Accident Sampling Program
PBX	-	Private Branch eXchange
P/S	-	Primary to Secondary
PSIA	-	Pounds per Square Inch Absolute
PVNGS	-	Palo Verde Nuclear Generating Station
QSPDS	-	Qualified Safety Parameter Display System
R	-	Rem
RAS	-	Recirculation Actuation Signal
RASCAL	-	Radiological Assesment System for Consequence AnaLysis

RCP	-	Reactor Coolant Pump
RCS	-	Reactor Coolant System
RFAT	-	Radiological Field Assessment Team
RMS	-	Radiation Monitoring System
RO	-	Reactor Operator
RP	-	Radiation Protection
RPM	-	Radiation Protection Monitor
RPS	-	Reactor Protection System
RRACS	-	Radiological Records and Access Control System
RVLMS	-	Reactor Vessel Level Monitoring System
SAE	-	Site Area Emergency
SBCS	-	Steam Bypass Control System
SCF	-	Standard Cubic Feet
SG	-	Steam Generator
SGTR	-	Steam Generator Tube Rupture
SIAS	-	Safety Injection Actuation Signal
SID	-	Self-Indicating Dosimeter
SM	-	Shift Manager
SPDS	-	Safety Parameter Display System
SRO	-	Senior Reactor Operator
SSE	-	Safe Shutdown Earthquake
SSN	-	Social Security Number
STA	-	Shift Technical Advisor
STSC	-	Satellite Technical Support Center
TEDE	-	Total Effective Dose Equivalent
TLD	-	ThermoLuminiscent Dosimeter
TODE	-	Total Organ Dose Equivalent
TSC	-	Technical Support Center
UFSAR	-	Updated Final Safety Analysis Report
USNRC	-	United States Nuclear Regulatory Commission
WGDT	-	Waste Gas Decay Tank
XFMR	-	Transformer

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-05	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIP-07		17-027I	RADIOLOGICAL ASSESSMENT COMMUNICATOR	Y/BUCKEYE APS DIST OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027J	PLANT STATUS TECHNICIAN	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027K	SECURITY COORDINATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027M	GOVERNMENT LIASON	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Q	EMERGENCY OPERATIONS DIRECTOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027R	DOSE ASSESSMENT HEALTH PHYSICIST	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Y	SHIFT TECHNICAL ADVISOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-08		05-015	SUPV-STDS	H/DAWPS-BLDG	PW	1	
EPIP-08		17-027	DISTRICT-MANAGER	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!

Remarks

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x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-05	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN : T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
EPIPS		00-000	WOLFE,W	X/STA-6050	PW	1	
EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
EPIPS		00-000	SMITH,D	X/STA-7294	PW	1	
EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
EPIPS		00-000	SONTAG, M	X/STA-7997	PW	1	
EPIPS		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	SPENCER,B	Y/MARICOPA CNTY DEPT OF EMERG MGMT 2035 N 52ND ST PHX AZ 85008	PW	1	
EPIPS		00-000	PORTER,J CAPTAIN	Y/MARICOPA CO SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	

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Procedure Number	Revision #	Effective Date
EPIP-05	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	
EPIPS		05-025		B/UII-CR	PW	1	
EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	

Remarks

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-05	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-127		B/UIII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
EPIPS		15-002	CAS	D/SEC-BLDG	PW	1	
EPIPS		15-003	SAS	D/SEC	PW	1	
EPIPS		17-001		C/ANX-DW-EOF-LIB	PW	1	
EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

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PROCEDURE INTENT

This procedure provides functional instruction for the activation and operation of the Backup Emergency Operations Facility

rev	description
10	This revision incorporates elements from previous revisions of the following procedure:

Procedure	Title
16TD-0EP012	Backup Emergency Operations Facility Actions

TABLE OF CONTENTS

1.0 Noteworthy Items

1.1 The designated backup for the Emergency Operations Facility is the APS Buckeye Office located at 615 North 4th Street, Buckeye, AZ 85326. Maximum occupancy loading of that facility is 31 people. Ensure that relocated EOF staff, combined with APS Buckeye Office staff (during business hours), will not exceed 31 personnel.

1.2 For security purposes, the APS Buckeye Office should be contacted prior to commencement of (re)location efforts to ensure that arrangements at the office are made for EOF (re)location. This contact should be made if the office is to be activated anytime other than standard office hours (8:30 a.m. to 5 p.m. on weekdays).

1.3 The primary means of transportation for EOF staff when relocating operations to the Backup Emergency Operations Facility will be two vans allocated from the APS Van Fleet. The Energy Information Center (EIC) tour bus can also be used if vans cannot be located. However, operation of the bus requires that the driver possess a valid State of Arizona Class-3 Commercial Drivers License. If no individual can be located possessing such a license, another means of transportation must be provided to facilitate the relocation effort.

1.4 The Radiological Assessment Communicator requires use of radio equipment for communications with the Radiological Field Assessment Teams (RFAT) after dispatch. Prior to relocation to the Backup Emergency Operations Facility, radio communications can be maintained with use of an MTS 2000 Model III Portable Radio normally stored in the EOF Storage Room. Ensure that availability of radio communications capabilities exist prior to relocation.

1.5 The instructions in this document are generally performed by the Administrative and Logistics Coordinator and the EOD, as these positions have access to the resources required for EOF relocation.

2.0 Preparing for Relocation

2.1 If relocation of EOF staff to the designated Backup Emergency Operations Facility is warranted, notify APS Buckeye Office personnel and APS Security of the intent to relocate. Refer to EPIP-07, Telecommunications.

2.2 Notify personnel at the following facilities of the intended EOF relocation and of the estimated time for Backup EOF activation:

- US Nuclear Regulatory Commission
- State / County agencies
- Technical Support Center
- Control Rooms (Units 1 / 2 / 3)
- Security Headquarters

2.3 Consult with the Radiological Assessment Coordinator and determine radiological plume path, if appropriate, to ensure that outside activities will not become radiologically impacted. Direct vehicle drivers accordingly.

2.4 Assign two drivers and instruct them to obtain two APS vans and drive them to the EOF parking lot. Extra keys are maintained in the EOF activation closet.

NOTE

Operation of the Energy Information Center tour bus requires that the driver possess a valid State of Arizona Class-3 Commercial Drivers License. If no one can be located possessing such a license, another means of transportation must be provided.

2.5 If procurement of two APS vans is not feasible, direct a qualified individual to perform the following actions:

2.5.1 Prepare the Energy Information Center (EIC) tour bus and drive it to the EOF parking lot. The tour bus key is located in the Administrative and Logistics Coordinator's key box in the EOF.

2.5.2 Ensure that the bus has an adequate fuel supply. The engine requires diesel fuel and the air conditioner generator requires gasoline.

2.5.3 If the EIC tour bus is unavailable, direct personnel to procure alternate transportation as required (APS pool vehicles, private vehicles, etc.).

2.6 Issue the APS Buckeye Office keys to the driver(s) upon return to the EOF.

2.7 Notify the van pool office (1822) of the serial numbers of the vans that will be used for Backup EOF transportation.

2.8 Designate a reserve RFAT vehicle for use as a mobile radio base station by the Radiological Assessment Communicator at the Backup EOF.

2.9 Get three MTS 2000 Model III Portable Radios from the EOF Storage Room for the Radiological Assessment Communicator and other communications needs. Ensure that availability of radio communications capabilities exist prior to relocation. While enroute to the Backup EOF, the Radiological Assessment Communicator will use the "RFAT" talk group, while the Emergency Operations Director will use the "EPLAN" talk group.

2.10 If no reserve RFAT vehicle is available, procure alternate transportation as required (APS pool vehicles, private vehicles, etc.).

2.11 Request that the State of Arizona representative, if present, arrange for a portable radio for communications with Arizona Radiation Regulatory Agency personnel from the Backup EOF.

NOTE

Since status boards do not exist at the APS Buckeye Office, status information must be maintained at that facility on Form EP-0330, Plant Status Overview (see EPIP-04, Emergency Operations Facility Actions, Appendix C - Forms).

2.12 Direct Administrative Support personnel to transcribe existing Plant Status Board information onto Form EP-0330, Plant Status Overview (see EPIP-04, Emergency Operations Facility Actions, Appendix C - Forms).

2.13 Direct Administrative Support personnel to copy and distribute completed Form EP-0330, Plant Status Overview (see EPIP-04, Emergency Operations Facility Actions, Appendix C - Forms) to EOF staff.

2.14 Review the EOF Storage Room and Emergency Kit contents for items that may be required at the Backup EOF.

2.15 Assist EOF personnel in loading necessary equipment, procedures, supplies, and required documentation into the designated vehicle(s).

2.16 Perform the following actions in concert with the Radiological Assessment Coordinator and the Security Coordinator:

2.16.1 Using the map from section 5.0 of this procedure, determine an appropriate site egress point and route for the relocation effort based on wind direction and known radiological plume travel.

2.16.2 Request that the Dose Assessment Health Physicist transfer dose assessment duties back to the affected Unit Radiation Protection Monitor until relocation to the Backup EOF has been completed.

2.16.3 Ensure that the route selected is unrestricted, i.e., no road construction in progress or heavy traffic, etc. The Security Coordinator can contact local law enforcement agencies to get this information.

2.16.4 When an appropriate site egress point and route have been selected, direct Administrative Support personnel to issue copies of the selected route to the designated driver(s).

2.17 When relocation preparation / notification activities have been completed, inform the Emergency Operations Director (EOD).

3.0 Relocating the EOF

3.1 When directed by the EOD to transfer EOF operations to the Backup EOF, perform the following actions:

3.1.1 Instruct the Government Liaison and Engineering staff (Technical Analysis Manager, Systems Engineering, Shift Technical Advisor) to relocate to the TSC (if activating the BEOF without first activating the EOF, the Government Liaison should go to the BEOF). The Government Liaison should locate near the NAN phone. The second Shift Technical Advisor should relocate to the Backup EOF.

3.1.2 The EC is authorized to direct upgrades/changes to the PARs as necessary when the EOD is unavailable. After the BEOF is activated, the EOD and Government Liaison should confer to develop and authorize upgrades/changes as necessary.

3.1.3 Request that the Radiological Assessment Coordinator determine evacuation locations of EOF radiological staff.

3.1.4 Relocate remaining EOF personnel to the APS Buckeye Office using the designated site egress point and route

3.2 Upon arrival at the Backup EOF, coordinate relocation activities with APS Buckeye Office personnel, as necessary.

NOTE

EOF personnel are strongly suggested to position themselves per the floor plan in Section 5.0 of this document. This will ensure that the telephone assignments specified in EPIP-07, Telecommunications, are maintained.

3.3 Assist the EOF staff with preparation of assigned work stations using Section 5.0 of this document.

3.4 If the Backup EOF is activated during Buckeye Office off-shift hours, disable call forwarding on the office telephones by pressing 73*##, and remove blocked numbers by pressing *82 and #82.

3.5 Request that the Radiological Assessment Communicator prepare a vehicle for use as the mobile radio base station in the parking lot immediately north of the APS Buckeye Office and direct him/her to establish contact with RFAT personnel when completed.

3.6 Direct Administrative Support personnel to update the Plant Status Overview boards in the workroom adjacent to the EOD Office.

3.7 Advise the EOD that corporate support may be required for direction if occupation of the Backup EOF appears to be long-term.

3.8 Request the EOD to notify the EC of Backup EOF activation.

3.9 Request the Government Liaison to notify Joint Emergency News Center personnel of Backup EOF activation.

4.0 EOF Restoration

4.1 When conditions indicate that Emergency Operations Facility habitability requirements are reassured, perform the following actions:

4.1.1 Request the Radiological Assessment Coordinator to determine EOF habitability and report results to the EOD.

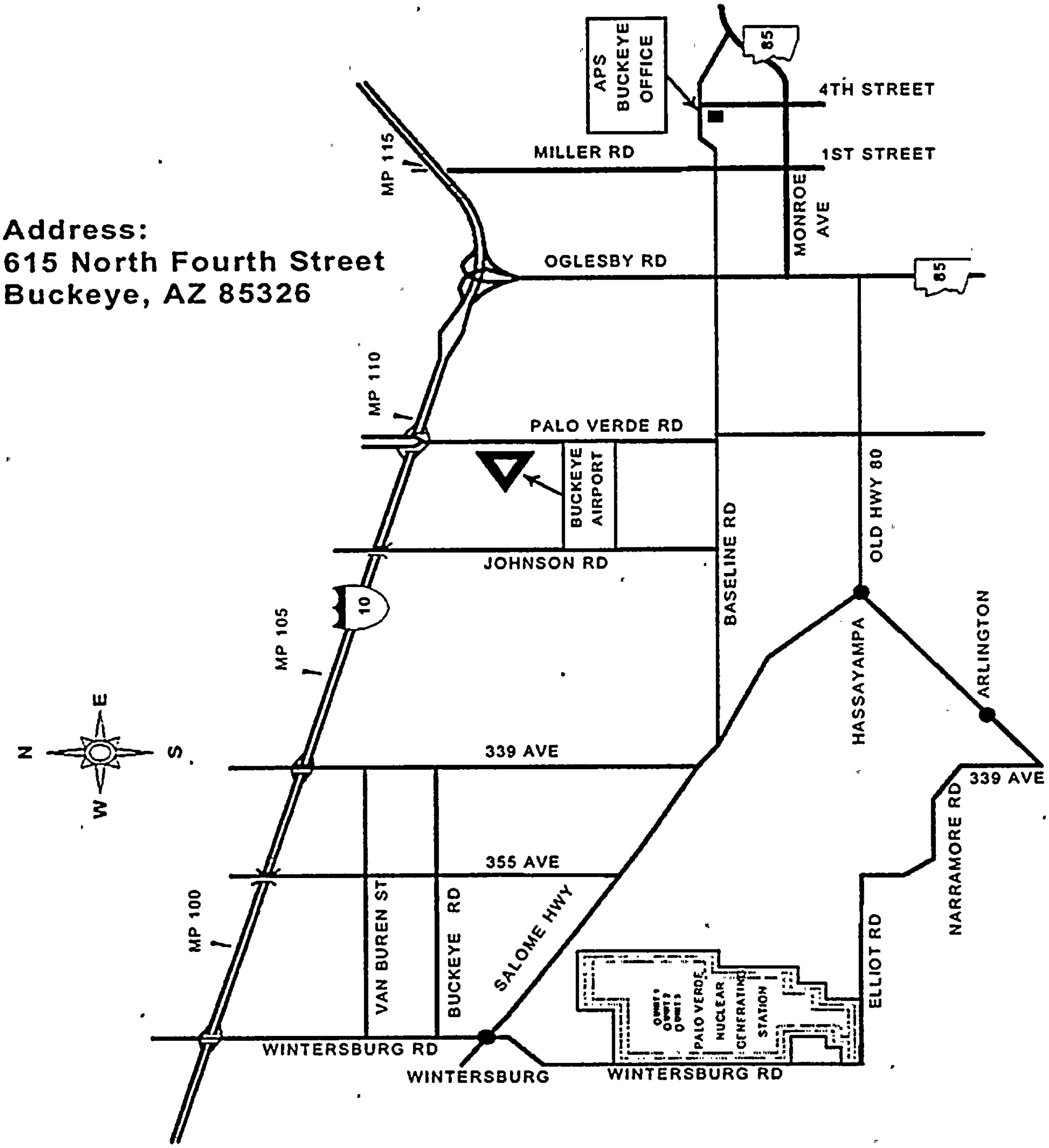
4.1.2 Restore the Backup EOF to preoccupation conditions.

4.2 When directed by the EOD, commence staff relocation to the Emergency Operations Facility.

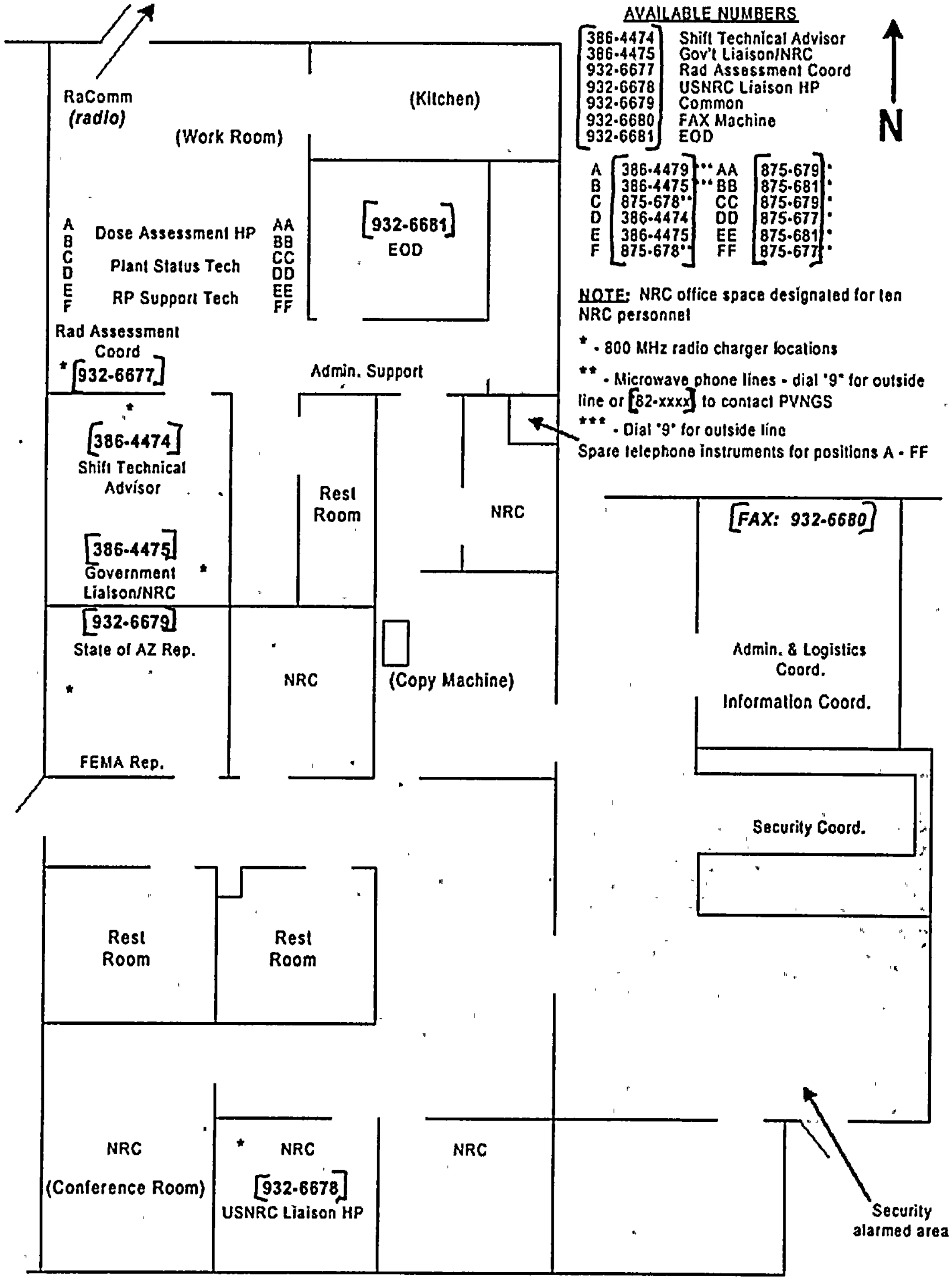
4.3 Upon arrival at the EOF, restore the facility to functional operation.

5.0 Backup EOF Map and Floor Plan

5.1 Backup EOF Map



5.2 Backup EOF Floor Plan



Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-06	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN : T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
EPIPS		00-000	WOLFE,W	X/STA-6050	PW	1	
EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
EPIPS		00-000	SMITH,D	X/STA-7294	PW	1	
EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
EPIPS		00-000	SONTAG, M	X/STA-7997	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 22	ST

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-06	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
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EPIPS		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	SPENCER,B	Y/MARICOPA CNTY DEPT OF EMERG MGMT 2035 N 52ND ST PHX AZ 85008	PW	1	
EPIPS		00-000	PORTER,J CAPTAIN	Y/MARICOPA CO SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
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EPIPS		01-007		WRF-DDC	PW	1	
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EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	

Remarks

REINSTATED

Quantity to be Reproduced	
PW 14	ST

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-06	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
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EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
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EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
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EPIPS		15-003	SAS	D/SEC	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 17	ST

For Questions Contact NIRM

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-06	**010**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
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EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 2	ST

For Questions Contact NIRM

x6131 m.s. 7720

REASSEMBLY AREA ACTIONS	EPIP-06	Revision 10

PROCEDURE INTENT

This document provides direction for organizing and activating the Reassembly Area, processing PVNGS evacuees, documenting individual and vehicle survey results, and transitioning to State of Arizona management of the Reassembly Area.

rev	description
10	This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16TD-0EP181	Reassembly Area Actions

TABLE OF CONTENTS

1.0 Introduction

1.1 This document prescribes the preliminary actions to be taken by PVNGS personnel to place the Buckeye Airport Reassembly Area into compliance with State of Arizona standard operating procedures following a PVNGS site evacuation. The instructions are tailored to accommodate PVNGS Radiation Protection and Security personnel for the time periods prior to and during arrival of site evacuees. Direction in this document fully complies with State of Arizona standard operating procedures and performance will preclude the necessity for the reorganization of services upon arrival of state representatives.

1.2 This document provides direction for performing the following task(s):

- organizing and activating the Reassembly Area
- processing PVNGS evacuees
- documenting individual and vehicle survey results
- transitioning to State of Arizona management of the Reassembly Area

1.3 Two diagrams illustrating the Buckeye Airport surrounding vicinity and the Reassembly Area Hangar organizational layout provide the user a functional composite of Reassembly Area requirements for reception of PVNGS evacuees.

1.4 The Reassembly Area Hangar at the Buckeye Municipal Airport is a shared facility used by PVNGS for assembling and decontaminating PVNGS evacuees and by Arizona Radiation Regulatory Agency personnel for staging state radiological field teams, analyzing field samples, personnel control and decontamination, and for monitoring and decontamination of the general public. During a PVNGS site evacuation in a radiological emergency, PVNGS asserts control over evacuated vehicles and personnel to minimize the spread of radioactive contamination. This document should be used only under conditions when organization of the Reassembly Area must be established to accommodate arriving PVNGS evacuees prior to the arrival of state representatives.

1.5 A transition to the State of Arizona for supervisory and management responsibilities will take place upon the arrival of Arizona Radiation Regulatory Agency personnel. The instructions contained in this document are intended to ease this transition.

1.6 The senior RP Technician responder is responsible for the requirements listed in Section 3.0.

1.7 Verify that a form EP-0501 (see Appendix A- Forms) is filled out for each vehicle, and a form EP-0502 (see Appendix A- Forms) for each individual. The forms should indicated "none" for contamination levels on all vehicles and personnel found clean.

1.8 The time estimate for three personnel to complete Section 2.0 of this document is 30 minutes from the time of arrival.

2.0 Organizing the Reassembly Area

2.1 Using the Reassembly Area key and Section 5.0 of this document, gain access to the facility via the Main Office.

2.2 Open the facility north roll-up door in the hangar.

2.3 Using the Buckeye Airport Reassembly Area Diagram in Section 5.0 as a guide, access the Emergency Planning Kit and, together with other equipment in the facility, prepare the outside area as follows:

2.3.1 Flip open the traffic control sign on the main entrance road.

2.3.2 Establish the Vehicle and Personnel Survey area using traffic cones and barricades, if available. Use additional cones to outline the vehicle decontamination station. Yellow cones are used inside the hanger, and red cones are used outside.

2.3.3 Using stanchions and rope from the facility, prepare the personnel frisking and egress scheme to provide efficiency.

2.3.4 Establish the frisking stations using equipment from the facility and equipment brought from the site. Extension cords are preferred for frisker power supplies, as batteries will not sustain adequate lifetime.

2.4 Upon their arrival, direct Security personnel to ensure that arriving PVNGS evacuees remain in their vehicles until radiologically processed.

2.5 Using the Airport Hangar Diagram in Section 5.0 as a guide, prepare the Reassembly Area as follows:

2.5.1 Establish a general equipment layout of the hangar as illustrated.

2.5.2 Outline diagrammed contaminated areas and lay step-off pads appropriately, ensuring adequate room for frisking areas.

2.5.3 Establish frisking stations as indicated, source checking each for operability and adequate response.

2.5.4 Establish showers and ensure functionality.

2.6 Inform the Radiological Assessment Coordinator in the Emergency Operations Facility that the Reassembly Area has been organized.

3.0 Processing Evacuees

NOTE

The following actions will occur as PVNGS site evacuees and vehicles are processed at the Reassembly Area, which may take hours to accomplish. Upon arrival of state representatives, supervision and management of facility operations will transition. Processing of evacuees and vehicles will continue to be performed from that point by PVNGS and state personnel in accordance with the State of Arizona Personnel, Vehicle, and Equipment Decontamination Standard Operating Procedure.

3.1 Ensure that Security personnel, aided by local law enforcement agencies (as necessary), have established vehicular control at the designated airport entrance point and at the Vehicle and Personnel Survey area.

3.2 Under general guidance of the Radiological Assessment Coordinator in the Emergency Operations Facility, perform required vehicle and personnel monitoring activities as necessary, using Forms EP-0501, Vehicle Decontamination, and EP-0502, Individual Body Decontamination (see Appendix A- Forms), for documentation.

3.3 Keep the Radiological Assessment Coordinator in the Emergency Operations Facility advised of continuing activities and of the transition of facility operational responsibilities to state personnel upon their arrival.

4.0 Transition of Facility Operations

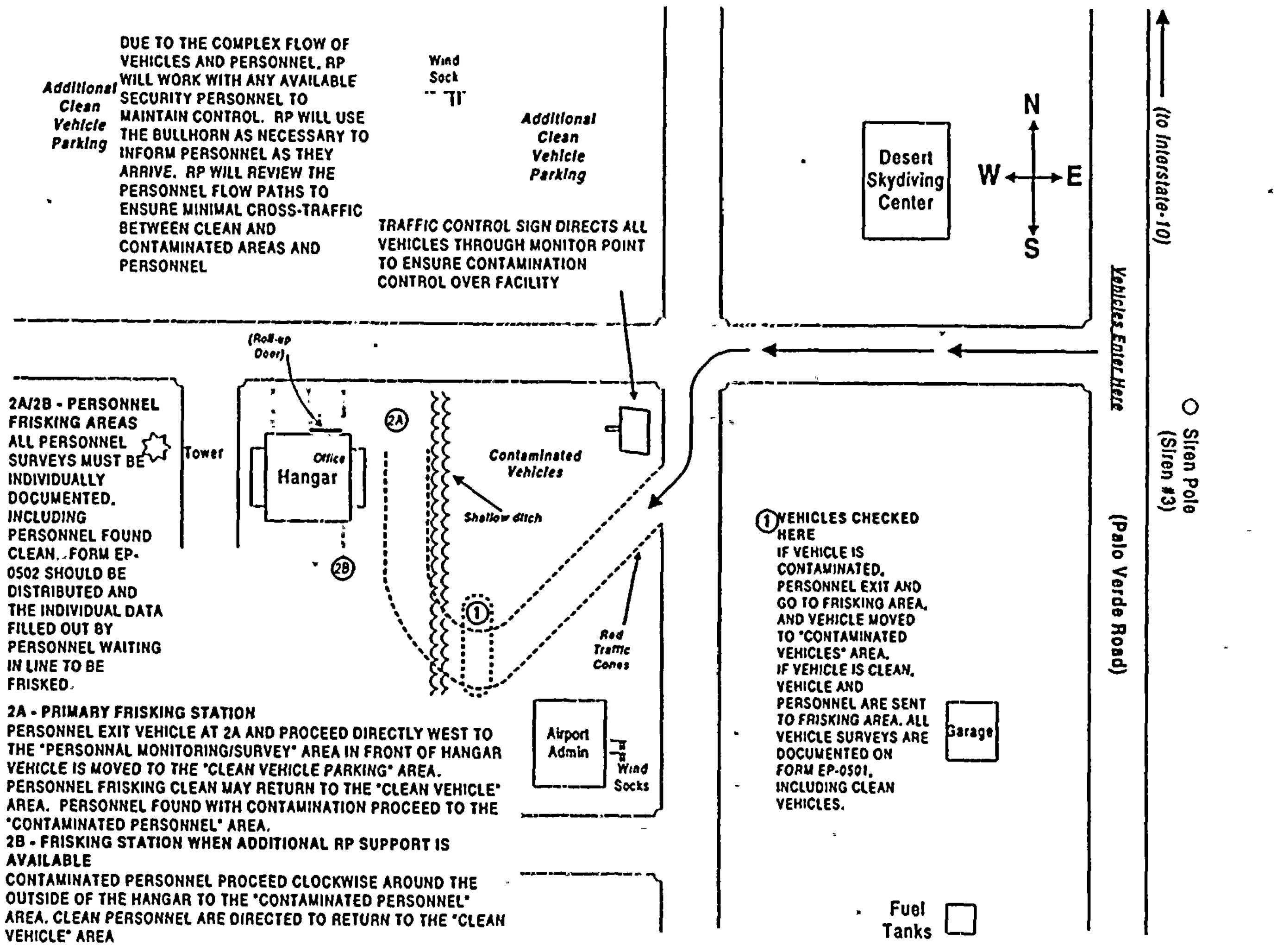
4.1 Upon arrival of Arizona Radiation Regulatory Agency personnel, provide a turnover of Reassembly Area management responsibilities, noting the following:

- Number of vehicles and personnel contaminated thus far. Review Forms EP-0501, Vehicle Decontamination, and EP-0502, Individual Body Decontamination (see Appendix A- Forms), if appropriate.
- Status of equipment and supply inventories
- Estimated time to process remaining vehicles and personnel
- Security and local law enforcement agency personnel status
- Any differences from state procedural requirements regarding layout or organization of the facility and surrounding vicinity
- Arizona Radiation Regulatory Agency expectations for PVNGS personnel

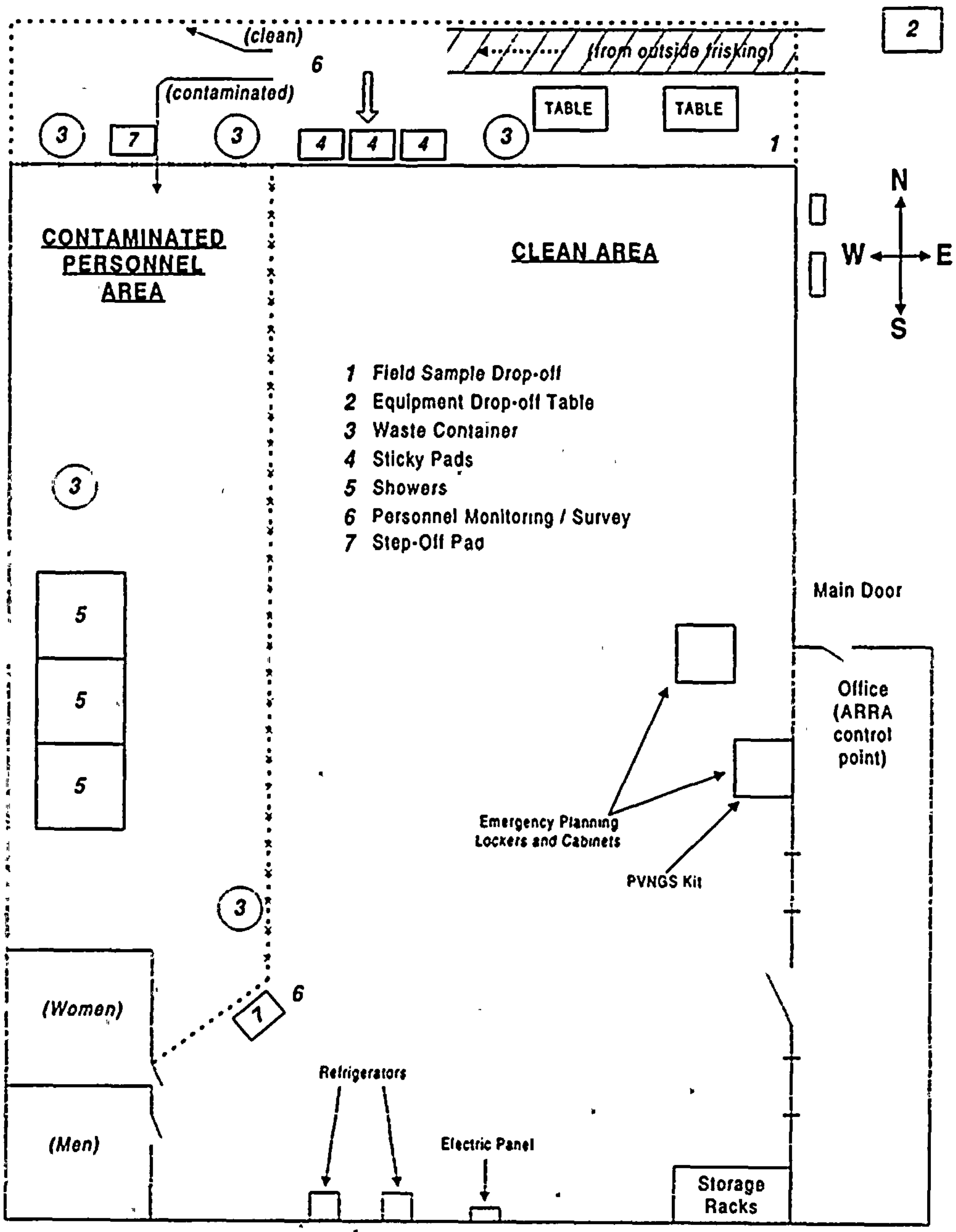
4.2 Following turnover of management responsibilities for the Reassembly Area, inform the Radiological Assessment Coordinator in the Emergency Operations Facility that management of the Reassembly Area has been transferred to state personnel.

4.3 Keep the Radiological Assessment Coordinator in the Emergency Operations Facility advised of continuing activities.

5.0 Reassembly Area Diagrams



This diagram illustrates the preferred organizational structure of the Reassembly Area and surrounding vicinity prior to arrival of PVNGS evacuees. In the event of personnel overflow at the Vehicle and Personnel Survey location, secondary frisking areas may be established at the south and west sides of the Reassembly Area Hangar. Personnel found contaminated at the secondary frisking stations may be directed to the shower area via a clockwise pattern around the outside of the facility, arriving near the west end of the entrance.



This diagram illustrates the preferred organizational structure of the Reassembly Area Hangar prior to arrival of PVNGS evacuees.

Appendix A- Forms

TABLE OF CONTENTS

1.0 Precautions and limitations

1.1 Forms in this appendix are to be considered "samples." In accordance with 01DP-0AP01, Procedure Process," the user may copy a sample form from the procedure if the copy is legible enough to use.

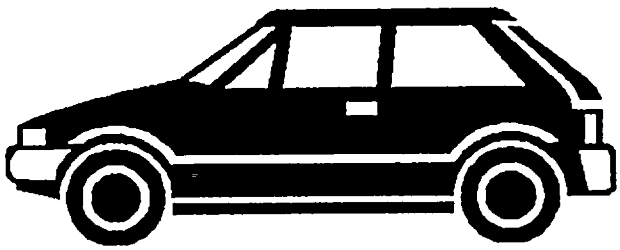
1.2 Forms in this appendix are available on the PVNGS Local Area Network (LAN), on drive V:, in directory \Eplan\Forms.

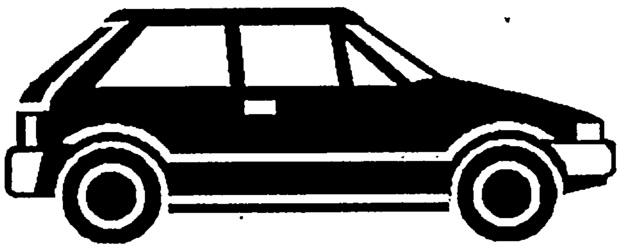
2.0 Forms

2.1 Form EP-0501, Vehicle Decontamination (sample)

FORM EP-0501 A **PVNGS EMERGENCY PLANNING**

VEHICLE DECONTAMINATION





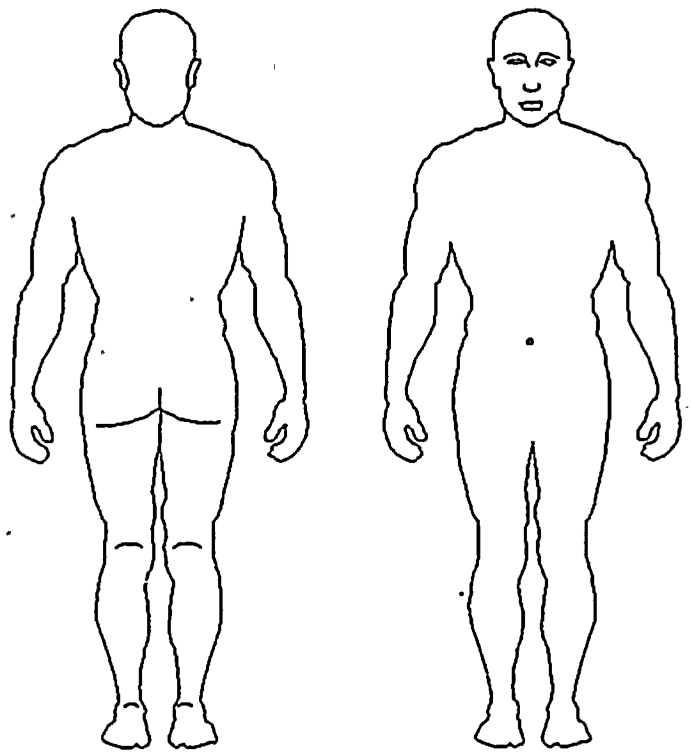
Monitor Name:		Date:	Time:
Vehicle Reg:	Owner:	Address:	
City:	State: ZIP:	Telephone:	
CONTAMINATION			
Location Outside Vehicle (describe):			
Location Inside Vehicle (describe):			
Location in Engine Compartment (describe):			
Highest Contamination Levels Prior to Decontamination: ________ cpm mrem/hr *(circle one)*			
Highest Contamination Levels After Decontamination: ________ cpm mrem/hr *(circle one)*			
Vehicle Impounded YES NO	*Item(s) Impounded:*		

F_EP0501.DOC 07/31/99 20:31:00

2.2 Form EP-0502, Individual Body Decontamination (sample)

FORM EP-0502A **PVNGS EMERGENCY PLANNING**

INDIVIDUAL BODY DECONTAMINATION



Monitor Name:		Date:	Time:
Patient Name:		Address:	
City.	State:	ZIP:	Telephone:
CONTAMINATION			
Location on Clothing (describe):			
Location on Body (describe):			
Highest Contamination Levels Prior to Decontamination: ______ cpm mrem/hr *(circle one)*			
Highest Contamination Levels After Decontamination: ______ cpm mrem/hr *(circle one)*			
Item(s) Impounded:			

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-07	**003**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIP-07		17-027I	RADIOLOGICAL ASSESSMENT COMMUNICATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027J	PLANT STATUS TECHNICIAN	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027K	SECURITY COORDINATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027M	GOVERNMENT LIASON	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Q	EMERGENCY OPERATIONS DIRECTOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027R	DOSE ASSESSMENT HEALTH PHYSICIST	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Y	SHIFT TECHNICAL ADVISOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
~~EPIP-08~~		~~05-015~~	~~SUPV [illegible]~~	~~[illegible]~~	~~PW~~	~~1~~	
~~[illegible]~~		~~[illegible]~~	~~DISTRICT MANAGER~~	~~Y/BUCKEYE-APS-DIST-OFFICE~~	~~PW~~	~~1~~	~~MAIL TO STA. 6050, R DUNCAN UPDATES~~
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!

Remarks
REINSTATED

Quantity to be Reproduced	
PW 18	ST

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-07	**003**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
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EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
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EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
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Remarks

REINSTATED

Quantity to be Reproduced	
PW 15	ST

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
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EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	
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EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
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EPIPS		05-098		A/UI-REM-SHDWN	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 15	ST

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Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-07	**003**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
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EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
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EPIPS		15-003	SAS	D/SEC	PW	1	
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Remarks
REINSTATED

Quantity to be Reproduced	
PW 14	ST

For Questions Contact NIRM

x6131 m.s. 7720

PROCEDURE INTENT

This procedure provides functional instruction for the activation and operation of the Satellite Technical Support Center

rev	description
3	This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16TD-0EP201	Telecommunications

TABLE OF CONTENTS

SECTION **PAGE**

1.0 Introduction

This document provides instructions for and listings of phone numbers, facsimile numbers, and various other telecommunications numbers associated with resources allocated to PVNGS emergency preparedness.

1.1 Emergency numbers

TYPE OF EMERGENCY	NUMBER
VALLEY WIDE	9-911
CHEMICAL	
Hazardous Material Emergencies	4444
Environmental	5605
24-Hour Duty Pager	1690
CONTROL ROOM	
Unit 1 Shift Manager	1206
Unit 2 Shift Manager	2206
Unit 3 Shift Manager	3206
FIRE	
Fire Emergency	4444
24-Hour Duty Pager	1690
MEDICAL	
Medical Emergency	4444
Clinic	2636
RADIOLOGICAL	
24-Hour Duty Pager	3130
SAFETY	6363
SECURITY	
Security Emergency	4444
Security Headquarters	6471
Security Headquarters	6473

1.2 How to Use Emergency Preparedness Phones

1.2.1 Standard beige phones

For calls to other phones at Palo Verde, dial the four digit extension. For local calls going outside the company, dial 9 followed by the complete number.

1.2.2 Long Distance Calls on Beige Phones:

1.2.2.1 Method One

Some emergency facility phones are set up for direct long distance dialing after dialing a 9 for an outside extension. These phones are limited to those for the facility directors and the USNRC, in most cases. Phones for certain communicators may also be programmed for long distance calling.

1.2.2.2 Method Two

If you have a company InfoSwitch Number (calling account number), you may make a long distance call by dialing 9-1-(area code)-(number). After hearing several fast beeps, enter the InfoSwitch Number. (During an emergency event, an InfoSwitch Number may be available from a management position assigned to that facility.)

1.2.2.3 Method Three

If you have a calling card, phone card, or other credit card that can be accessed by dialing an 800 number, dial 9-1-800-(number).

1.2.2.4 Method Four

If none of the above methods work, locate the facility coordinator and request assistance or dial the operator at 0.

1.2.3 Dedicated phones

These phones can be used as any other site phone.

1.2.4 Dedicated phones with N-buttons

When using the N-Line button on a dedicated phone, you may dial four digits to contact any of the other dedicated phones with N-Lines. You cannot call other plant phones directly. To call outside the company system, you must dial 9 twice to receive an outside line.

1.2.5 FTS-2000 (ENS) phones with 700 / 571 numbers

These phones may be used to call other FTS-2000 (Federal Telecommunications System) phones by dialing the area (facility) code and number for the FTS-2000 phone being called. Federal employees with special dialing privileges on the FTS-2000 System may use these calling methods. It is not necessary to dial a 1 preceding the area (facility) code of the number being called.

1.2.6 Ringdown phones

Certain positions have special ringdown phone circuits. To reach all the parties on that circuit, lift the receiver and press the call button for three seconds. Wait for the other parties to answer. Unanswered phones on the circuit will continue to ring in the background for approximately one minute. During this time, you may ask the first responders to stand by.

1.2.7 Dedicated lines

Dedicated phones function as any other plant PBX phone. If other lines are not available, you may use these phones to place or receive calls, just as you can with normal beige phones. Dedicated phones are administratively dedicated for specific purposes, but may be used as necessary.

The administratively dedicated phones should be reserved for specific functions as follows:

1.2.7.1 EC / EOD Line

provides a direct communications link between the Emergency Coordinator and the Emergency Operations Director on dedicated phones (SL and Standard, but not the dedicated phone)

1.2.7.2 CR / STSC / TSC / OSC / EOF Lines

provides direct communications between any two of these facilities on the designated line.

1.2.7.3 Technical Line

provides direct communications with CR, CR Simulator, STSC, STSC Simulator, and EOF for transmitting technical and operational data or assessment

1.2.7.4 Radiological Line

provides direct communications with the RP Office, STSC, STSC Simulator, TSC, and OSC for transmitting in-plant radiological information and aid in the formation of OSC and field monitoring teams

1.2.7.5 Environmental Assessment Line

provides direct communications with the STSC, STSC Simulator, TSC, and EOF for transmitting offsite dose rate projections and radiological conditions

1.2.7.6 Maintenance Control Line

provides direct communications with the CR, CR Simulator, TSC, and OSC -- for transmitting maintenance and repair information

The NAN Phone and OPS Ringdown phones are brown in some Units. Some administratively dedicated phones are beige.

1.2.8 Yellow ringdown lines

These phones provide communications links between PVNGS and offsite locations. When the call button is pushed, all similar phones will ring simultaneously at all locations -- no number needs to be dialed.

1.2.8.1 NAN (Notification Alert Network)

provides capabilities for notifications only -- will ring at STSC-1, STSC-2, STSC-3, TSC, EOF, ADEM/EOC, ARRA, DPS, MCSO, and MCDEM/EOC. (Roll call procedure required.)

1.2.8.2 Operations Voice Circuits #1 and #3

provides lines for transmission of technical information -- will ring at STSC-1, STSC-2, STSC-3, TSC, EOF, ADEM, and ARRA. (ARRA - #1 only)

1.2.8.3 Operations Voice Circuits #2 and #4

provides lines for transmission of technical information -- will ring at STSC Simulator, TSC, EOF, ADEM, and ARRA. (ARRA - #4 only)

1.2.9 Blue ringdown line

This phone is the public information phone in the EOF -- will ring at JENC (employs two circuits).

1.2.10 Beige PBX

Normal plant phones are available for direct communications between all personnel.

1.2.11 Cellular phones

Emergency cellular phone antennas are located in each Unit office corridor on the 140' elevation, the TSC, and the EOF. In the Units, phones are stored as directed by Unit Management.

1.2.12 Paging phones

A dedicated paging phone is located in each STSC and in the EOF. These phones have direct access to the paging system and are programmed to be used only for the three "all page" paging numbers.

1.2.13 Plant Paging System

The Plant Paging System is designed to allow users to page individual areas of the plant. This system has two access modes -- the first mode is the Direct Page, which overrides other pages in progress and is restricted to certain phones only; the second mode is the Delayed Page, which allows a person to leave a message that is played back over the area paged in about 15 to 30 seconds.

A special direct paging number, 8000 overrides all other pages. This page covers those facilities that have paging capability. THIS PAGE SHOULD ONLY BE USED WHEN AN EMERGENCY MUST BE ANNOUNCED IMMEDIATELY. Dialing the other numbers accesses only those facilities.

All site public address systems are interconnected such that all announcements using PA Access 8000 will be heard in all Units and buildings simultaneously. The pole mounted speakers for the Unit Evacuation System are the only speakers which are not included in this interconnection. To include the outside pole mounted speakers, an announcement must be made from the Control Rooms or the TSC on the Unit Evacuation System.

PAGE AREA	DELAYED #
Unit 1	1111
Unit 2	1112
Unit 3	1113
Technical Support Center	1114
Emergency Operations Facility	1115
Water Reclamation Facility	1116
Old Administration Building D	1117
Service Building	1117
Security Headquarters	1117
Administration Complex Buildings A and B	1179
North Annex	1169
Unit 1 Operations Support Building	1171
Unit 2 Operations Support Building	1172
Unit 3 Operations Support Building	1173
Main Warehouse	1174
Administration Annex Addition Building F	1176
Vehicle Maintenance	1177
Energy Information Center	1189

PAGE AREA	DIRECT #
Site-wide All-page.:	8000
Unit 1	8001
Unit 2	8002
Unit 3	8003
Technical Support Center	8004
Emergency Operations Facility	8005
Water Reclamation Facility	8006
Old Administration Building D	8007
Service Building	8007
Security Headquarters	8007
Administration Annex Building E - Floors 1 and 2	8008
Administration Complex Buildings A and B	8009
North Annex	8010
Unit 1 Operations Support Building	8011
Unit 2 Operations Support Building	8012
Unit 3 Operations Support Building	8013
Main Warehouse	8014
Administration Annex Addition Building F	8016
Vehicle Maintenance	8017
Energy Information Center	8019
Low Level Radiological Material Storage Facility	8020

2.0 Phone listings sorted by agency/facility/position

Agency	Position	at Facility	Phone
ADEM	FAX ADEM	Arizona Division of Emergency Mgmt.	602-231-6271
ADEM	FAX TOC	Arizona Division of Emergency Mgmt.	602-231-6202
ADEM	State of Arizona Representative	Backup EOF	623-932-6679
ADEM	Arizona Division of Emergency Mgmt.	Communications Area	602-231-6201 602-231-6223
ADEM	FAX ADEM	Message Center (State/JENC)	602-231-6250 602-231-6271
ADEM	Arizona Division of Emergency Mgmt.	Offsite Technical Representative (TOC)	602-392-7506 602-392-7508
ADEM	Arizona Division of Emergency Mgmt.	Operations Group Chief	602-231-6320
ADEM	Arizona Division of Emergency Mgmt.	Policy Group Chief	602-231-6208 602-392-7509
ADEM	Arizona Division of Emergency Mgmt.	Public Information / Media	602-231-6224
ADEM	Arizona Division of Emergency Mgmt.	Public Inquiry Center	602-231-6207 602-231-6327 602-231-6398 602-231-6327
ADEM	Arizona Division of Emergency Mgmt.	Switchboard (State EOC / TOC)	602-244-0504
ADEM	Arizona Division of Emergency Mgmt.	Technical Representative Ringdown (APS)	OPS-4
ADEM	Arizona Division of Emergency Mgmt.	TOC Radiation Analysis (ARRA)	602-392-7511 602-392-7512

Agency	Position	at Facility	Phone
ADEM	Arizona Division of Emergency Mgmt.	TOC Radiation Analysis (ARRA)	602-392-7511 602-392-7512
Airport	Buckeye Municipal Airport	3000 S Palo Verde Road Hangar #3 Buckeye AZ	623-386-7392
Airport	FAX Buckeye Airport	Buckeye Airport	623-386-7393
Airport	FAX verification Buckeye airport	Buckeye Airport reassembly area	623-386-7392
Ambu.	AirEvac	Air Ambulance	623-247-3822
ANI	American Nuclear Insurers		860-561-3433
APS	Backup EOF District Supervisor digital pager	Backup EOF	602-225-4713
APS	Backup EOF District Supervisor off-hours	Backup EOF	623-932-2875
APS	Backup EOF District Supervisor off-hours (alt.)	Backup EOF	623-386-6836
APS	Backup EOF Front desk	Backup EOF	623-386-4475 623-932-6677 623-932-6679
APS	FAX JENC dedicated to	Customer Call Center	602-944-8208
APS	Security	Headquarters Phoenix	81-2222
APS	FAX Customer Call Center dedicated to	JENC	602-231-6365
APS	Communications Duty Officer	Phoenix	602-250-2277
APS	FAX Media Relations	Phoenix	602-250-2419
APS	FAX verification Media Relations	Phoenix	602-250-2277
ARRA	FAX ARRA Circuit #1	Arizona Radiation Regulatory Agency	221
ARRA	FAX ARRA verification	Arizona Radiation Regulatory Agency	602-255-4845
ARRA	Arizona Radiation Regulatory Agency	Switchboard	602-255-4845
Canberra	Canberra Nuclear Services	Whole Body Count	203-238-2351
CE	Combustion Engineering		203-285-9669
County	FAX JENC dedicated to	County EOC	602-267-1355
County	FAX State of AZ to	County EOC	602-275-1638
County	FAX verification County EOC	County EOC	602-273-1411
County	County EOC dedicated FAX to	JENC	602-231-6355
County	County EOC dedicated FAX to	State EOC	602-231-6271
DOE	Department of Energy	Joint Nuclear Accident Coordination Center	505-845-4667
DOE	Oak Ridge Associated Universities	Radiation Emergency Assistance Center	423-481-1000 ext. 1502
DPS	Arizona Department of Public Safety	Main switchboard	602-223-2000
FAA	Federal Aviation Administration	Western-Pacific Region HQ Lawndale, CA	301-725-3550
FEMA	FEMA EOF Representative	Backup EOF	623-386-4475
FEMA	Federal Emergency Management Agency	Region IX HQ San Francisco, CA	415-923-7100 415-923-7250
Fire	Phoenix Fire Departments		602-253-1191
Hosp.	Good Samaritan Medical Center	Emergency Center	602-239-2222 602-239-2224
Hosp.	Maryvale Samaritan Medical Center	Emergency Center	623-848-5200 623-848-5203 623-848-5204

Agency	Position	at Facility	Phone
INPO	Institute of Nuclear Power Operations	Duty Officer	800-321-0614
INPO	FAX INPO	Institute of Nuclear Power Operations	707-644-8549 707-644-8594
INPO	Institute of Nuclear Power Operations	Switchboard	707-644-8000
KTAR	KTAR Radio	24-Hour Operations	602-263-5556
KTAR	KTAR Radio	Switchboard (normal hours only)	602-274-6200
MCDEM	Maricopa County Department of Emergency Management	Drill Controller	602-275-4171
MCDEM	Maricopa County Department of Emergency Management	Emergency Operations Center	602-273-1411 602-273-1412 602-273-1413 602-273-1414
MCDEM	Maricopa County Department of Emergency Management	Health	602-275-8539
MCDEM	Maricopa County Department of Emergency Management	Highway	602-275-8538
MCDEM	FAX Maricopa County Department of Emergency Management	JENC (from County EOC)	602-267-1355
MCDEM	Maricopa County Department of Emergency Management	Maricopa County Sheriff's Office	602-275-8537
MCDEM	Maricopa County Department of Emergency Management	Public Information Coordinator	602-275-1633
MCDEM	Maricopa County Department of Emergency Management	Red Cross	602-275-8530
MCDEM	FAX Maricopa County Department of Emergency Management	State EOC (from County EOC)	602-275-1638
MCDEM	Maricopa County Department of Emergency Management	Switchboard	602-273-1411
MCSO	Maricopa County Sheriff's Office	Non-emergency number	602-256-1011
NWS	National Weather Service	David Runyan	602-379-4607 ext. 223
NWS	National Weather Service	Phoenix Forecast Office	602-379-4609 602-379-4611
NWS	National Weather Service	Robert Wilte (backup)	602-379-4609 602-379-4611
PG&E	Pacific Gas & Electric	Nuclear Operations Services	805-545-4336
PG&E	Pacific Gas & Electric	Senior Vice President	415-973-4684
PG&E	Pacific Gas & Electric	Switchboard	805-545-6000
PVNGS	Administrative & Logistics Coordinator	Backup EOF	623-386-4475
PVNGS	Administrative Support	Backup EOF	623-386-4475
PVNGS	Dose Assessment Health Physicist	Backup EOF	623-932-6677
PVNGS	Emergency Operations Director	Backup EOF	623-932-6681
PVNGS	FAX Administrative Support	Backup EOF	623-932-6680
PVNGS	Government Liaison	Backup EOF	623-386-4475
PVNGS	Radiation Protection Support Technician	Backup EOF	623-932-6677
PVNGS	Radiological Assessment Communicator	Backup EOF	(radio)
PVNGS	Radiological Assessment Coordinator	Backup EOF	623-932-6677
PVNGS	Security Coordinator (Access Control)	Backup EOF	623-932-6677

Agency	Position	at Facility	Phone
PVNGS	Technical Analysis Manager	Backup EOF	623-386-4474
PVNGS	USNRC Liaison Health Physics	Backup EOF	623-932-6677
PVNGS	Security	Badging	3161
PVNGS	Radiation Protection Instrumentation	Calibration Laboratory	3508 / 3512
PVNGS	Radiation Protection Instrumentation	Canberra WB Count	2606 / 2607
PVNGS	FAX CAS	CAS	2687
PVNGS	Security	CAS	6471 / 6472
PVNGS	Communications Dept. Leader	Cellular phone	602-228-8967
PVNGS	Communications Dept. Leader	Cellular phone	602-616-4622
PVNGS	Fire Team	Cellular phone	602-370-4392
PVNGS	Communications Dept. Leader	Cellular phone (alt.)	602-228-1879
PVNGS	Control Room Supervisor	Control Room Simulator A	7205
PVNGS	Drill Controller	Control Room Simulator A	5501
PVNGS	Emergency Coordinator	Control Room Simulator A	7206
PVNGS	EOF dedicated phone to	Control Room Simulator A	6038
PVNGS	Maintenance Control Line phone	Control Room Simulator A	6040
PVNGS	OSC dedicated phone to	Control Room Simulator A	6036
PVNGS	Reactor Operators	Control Room Simulator A	7200 - 7204
PVNGS	Shift Supervisor	Control Room Simulator A	7206
PVNGS	STSC Sim. A dedicated phone to	Control Room Simulator A	6035
PVNGS	Technical Line phone	Control Room Simulator A	6039
PVNGS	TSC dedicated phone to	Control Room Simulator A	6037
PVNGS	Control Room Supervisor	Control Room Unit 1	1205
PVNGS	EOF dedicated phone to	Control Room Unit 1	1105
PVNGS	Maintenance Control Line	Control Room Unit 1	1101
PVNGS	Office corridor	Control Room Unit 1	602-370-2745
PVNGS	OSC dedicated phone to	Control Room Unit 1	1104
PVNGS	Reactor Operator(s)	Control Room Unit 1	1200-1204 1206-1207
PVNGS	Shift Manager	Control Room Unit 1	1206
PVNGS	STSC dedicated phone to	Control Room Unit 1	1103
PVNGS	Technical Line at RMS DCU	Control Room Unit 1	1100
PVNGS	TSC dedicated phone to	Control Room Unit 1	1102
PVNGS	Control Room Supervisor	Control Room Unit 2	2205
PVNGS	EOF dedicated phone to	Control Room Unit 2	2105
PVNGS	Maintenance Control Line	Control Room Unit 2	2101
PVNGS	Office corridor	Control Room Unit 2	602-370-2746
PVNGS	OSC dedicated phone to	Control Room Unit 2	2104
PVNGS	Reactor Operator(s)	Control Room Unit 2	2200-2204 2206-2207
PVNGS	Shift Manager	Control Room Unit 2	2206
PVNGS	STSC dedicated phone to	Control Room Unit 2	2103
PVNGS	Technical Line at RMS DCU	Control Room Unit 2	2100
PVNGS	TSC dedicated phone to	Control Room Unit 2	2102
PVNGS	Control Room Supervisor	Control Room Unit 3	3205
PVNGS	EOF dedicated phone to	Control Room Unit 3	3105

Agency	Position	at Facility	Phone
PVNGS	Maintenance Control Line	Control Room Unit 3	3101
PVNGS	Office corridor	Control Room Unit 3	602-370-2747
PVNGS	OSC dedicated phone to	Control Room Unit 3	3104
PVNGS	Reactor Operator(s)	Control Room Unit 3	3200-3204 3206-3207
PVNGS	Shift Manager	Control Room Unit 3	3206
PVNGS	STSC dedicated phone to	Control Room Unit 3	3103
PVNGS	Technical Line at RMS DCU	Control Room Unit 3	3100
PVNGS	TSC dedicated phone to	Control Room Unit 3	3102
PVNGS	PVNGS meteorologist	Dean Peckham	6949
PVNGS	Communications	Deer Valley Office	602-371-7171
PVNGS	Radiation Protection Instrumentation	Dosimetry	3900
PVNGS	Security	Emergency	4444
PVNGS	Communications	Energy Information Center	6434
PVNGS	Administrative and Logistics Coordinator dedicated phone	EOF	6284
PVNGS	Administrative Support	EOF	6720
PVNGS	Dose Assessment Health Physicist	EOF	6719
PVNGS	Drill Controller	EOF	6178 / 6181
PVNGS	Emergency Operations Director	EOF	6012
PVNGS	EOF Cellular phone	EOF	602-370-2743
PVNGS	FAX EOF	EOF	623-386-3630
PVNGS	FAX EOF	EOF	6134
PVNGS	FAX EOF Circuit #1	EOF	101
PVNGS	FAX EOF Circuit #2	EOF	111
PVNGS	FAX EOF verification	EOF	6058
PVNGS	FAX TSC dedicated to	EOF	6134
PVNGS	FEMA Representative	EOF	6192
PVNGS	Government Liaison	EOF	6182
PVNGS	Information Coordinator	EOF	2720
PVNGS	JENC dedicated FAX to	EOF	101
PVNGS	Lead Controller	EOF	3936
PVNGS	Plant Status Technician	EOF	1513
PVNGS	Radiation Protection Support Technician	EOF	6141
PVNGS	Radiological Assessment Communicator	EOF	6194
PVNGS	Radiological Assessment Communicator dedicated phone phone from TSC	EOF	6281
PVNGS	Radiological Assessment Coordinator	EOF	6189
PVNGS	Radiological Assessment Coordinator dedicated phone from Control Room	EOF	6282
PVNGS	Radiological Assessment Coordinator dedicated phone from OSC	EOF	6279
PVNGS	Radiological Assessment Coordinator dedicated phone from STSC	EOF	6283
PVNGS	Reserved Number	EOF	3514 / 2764 3938 / 3917 2986

Agency	Position	at Facility	Phone
PVNGS	Security Coordinator (Access Control)	EOF	6187
PVNGS	Shift Technical Advisor	EOF	1515
PVNGS	State of Arizona Representative	EOF	6191
PVNGS	Systems Engineering	EOF	1517 / 6183
PVNGS	Technical Analysis Manager	EOF	1516
PVNGS	Technical Analysis Manager dedicated phone	EOF	6278
PVNGS	USNRC Liaison Health Physics	EOF	1873
PVNGS	Security	Headquarters	6473 / 6475
PVNGS	Administrative Support	JENC	602-231-6370 602-231-6373
PVNGS	APS Spokesperson	JENC	602-231-6368
PVNGS	APS Technical Advisor	JENC	602-231-6365
PVNGS	Drill Controller	JENC	602-231-6351 602-231-6352
PVNGS	Facility Coordinator	JENC	602-231-6359
PVNGS	FAX Circuit #1 (EOF / JENC)	JENC	251
PVNGS	FAX from APS Media Relations	JENC	602-231-6365
PVNGS	FAX from County	JENC	602-231-6355
PVNGS	FAX from Customer Call Center	JENC	602-371-6793
PVNGS	FAX from EOF	JENC	602-231-6367
PVNGS	FAX from State	JENC	602-231-6362
PVNGS	FEMA Representative(s)	JENC	602-231-6375
PVNGS	JENC FAX	JENC	251
PVNGS	JENC FAX	JENC	602-231-6365
PVNGS	JENC FAX	JENC	602-231-6367
PVNGS	JENC FAX verification	JENC	602-231-6359
PVNGS	Maricopa County Spokesperson / County PIO	JENC	602-231-6358 602-231-6395
PVNGS	Media Alert	JENC	602-231-6353
PVNGS	Media Briefing Area JENC (dial-out only)	JENC	602-231-6382 602-231-6391
PVNGS	Media Briefing Area JENC (Lunchroom)	JENC	602-231-6376 602-231-6377 602-231-6378
PVNGS	Media In-bound	JENC	602-231-6396 602-231-6335 602-231-6338
PVNGS	Media In-bound JENC (front door check-in)	JENC	602-231-6332
PVNGS	Public Inquiry	JENC	602-231-6354
PVNGS	State of AZ Spokesperson / State PIO	JENC	602-231-6361 602-231-6363 602-231-6364
PVNGS	State Technical Advisor	JENC	602-231-6360
PVNGS	Control Room dedicated phone to	OSC Unit 1	1125
PVNGS	EOF dedicated phone to	OSC Unit 1	1124
PVNGS	Maintenance Control Line	OSC Unit 1	1122

Agency	Position	at Facility	Phone
PVNGS	OSC Coordinator and Staff	OSC Unit 1	1278
PVNGS	Radiological Assessment Line	OSC Unit 1	1123
PVNGS	STSC / TSC dedicated phone to	OSC Unit 1	1120
PVNGS	STSC dedicated phone to	OSC Unit 1	1127
PVNGS	STSC Sim. A dedicated phone to	OSC Unit 1	6029
PVNGS	TSC dedicated phone to	OSC Unit 1	1126
PVNGS	Control Room dedicated phone to	OSC Unit 2	2125
PVNGS	EOF dedicated phone to	OSC Unit 2	2124
PVNGS	Maintenance Control Line	OSC Unit 2	2122
PVNGS	OSC Coordinator and Staff	OSC Unit 2	2278
PVNGS	Radiological Assessment Line	OSC Unit 2	2123
PVNGS	STSC / TSC dedicated phone to	OSC Unit 2	2120
PVNGS	STSC dedicated phone to	OSC Unit 2	2127
PVNGS	TSC dedicated phone to	OSC Unit 2	2126
PVNGS	Control Room dedicated phone to	OSC Unit 3	3125
PVNGS	EOF dedicated phone to	OSC Unit 3	3124
PVNGS	Maintenance Control Line	OSC Unit 3	3122
PVNGS	OSC Coordinator and Staff	OSC Unit 3	3278
PVNGS	Radiological Assessment Line	OSC Unit 3	3123
PVNGS	STSC / TSC dedicated phone to	OSC Unit 3	3120
PVNGS	STSC dedicated phone to	OSC Unit 3	3127
PVNGS	TSC dedicated phone to	OSC Unit 3	3126
PVNGS	Communications Dept. Leader	Pager	800-393-0238
PVNGS	Communications Duty Officer	Pager	1912
PVNGS	Communications Duty Officer	Phoenix	5701
PVNGS	Employee Communications	PVNGS	6422
PVNGS	FAX Communications	PVNGS	171
PVNGS	FAX Communications	PVNGS	6243
PVNGS	FAX Communications Verification	PVNGS	5757
PVNGS	Media Relations Rep.	PVNGS	6433
PVNGS	FAX Radiation Monitoring	Radiation Monitoring Tech Unit 1	1709
PVNGS	Radiation Monitoring	Radiation Monitoring Tech Unit 1	1273 / 1275
PVNGS	FAX Radiation Monitoring	Radiation Monitoring Tech Unit 2	2709
PVNGS	Radiation Monitoring	Radiation Monitoring Tech Unit 2	2273 / 2275
PVNGS	FAX Radiation Monitoring	Radiation Monitoring Tech Unit 3	3709
PVNGS	Radiation Monitoring	Radiation Monitoring Tech Unit 3	3273 / 3275
PVNGS	Radiation Protection Instrumentation	Respirator Fit Test Facility	3161 / 3177
PVNGS	Radiation Protection Unit 1	RP Island Unit 1	1403 / 1404 1405
PVNGS	Radiological Assessment Line	RP Island Unit 1	1121
PVNGS	Radiation Protection Unit 2	RP Island Unit 2	2403 / 2404 2405
PVNGS	Radiological Assessment Line	RP Island Unit 2	2121
PVNGS	Radiation Protection Unit 3	RP Island Unit 3	3403 / 3404 3405
PVNGS	Radiological Assessment Line	RP Island Unit 3	3121

Agency	Position	at Facility	Phone
PVNGS	Security	SAS	1220 / 1221
PVNGS	Security	Section Leader	1715
PVNGS	FAX Security HQ	Security Headquarters	2687
PVNGS	Instructor Console	Simulator A	5500
PVNGS	CR Sim. A dedicated phone to	STSC Simulator A	6027
PVNGS	FAX STSC Simulator A	STSC Simulator A	161
PVNGS	Drill Controller	STSC Simulator A	6119
PVNGS	Environmental Assessment Line	STSC Simulator A	6033
PVNGS	EOD dedicated phone to	STSC Simulator A	6034
PVNGS	EOF dedicated phone to	STSC Simulator A	6030
PVNGS	FAX Simulator STSC Circuit #1 or #2	STSC Simulator A	161
PVNGS	OSC dedicated phone to	STSC Simulator A	6028
PVNGS	Rad. Assessment Line phone	STSC Simulator A	6032
PVNGS	RM Technician	STSC Simulator A	1274
PVNGS	RP Monitor	STSC Simulator A	1406
PVNGS	Shift Technical Advisor	STSC Simulator A	5008 / 6119
PVNGS	TSC dedicated phone to	STSC Simulator A	6029
PVNGS	Control Room dedicated phone to	STSC Unit 1	1110
PVNGS	Drill Controller	STSC Unit 1	3194
PVNGS	EC / EOD dedicated phone to	STSC Unit 1	1109
PVNGS	Emergency Coordinator	STSC Unit 1	1207
PVNGS	Environmental Assessment Line	STSC Unit 1	1108
PVNGS	EOF dedicated phone to	STSC Unit 1	1128
PVNGS	FAX STSC Unit 1 Circuit #1 or #2	STSC Unit 1	131
PVNGS	OSC dedicated phone to	STSC Unit 1	1119
PVNGS	Rad. Assessment Line phone	STSC Unit 1	1107
PVNGS	Shift Techical Advisor	STSC Unit 1	1207
PVNGS	Shift Technical Advisor	STSC Unit 1	1207
PVNGS	STSC Communicator	STSC Unit 1	1133
PVNGS	Technical Line phone	STSC Unit 1	1106
PVNGS	TSC dedicated phone to	STSC Unit 1	1120
PVNGS	Control Room dedicated phone to	STSC Unit 2	2110
PVNGS	Drill Controller	STSC Unit 2	3195
PVNGS	EC / EOD dedicated phone to	STSC Unit 2	2109
PVNGS	Emergency Coordinator	STSC Unit 2	2207
PVNGS	Environmental Assessment Line	STSC Unit 2	2108
PVNGS	EOF dedicated phone to	STSC Unit 2	2128
PVNGS	FAX STSC Unit 2 Circuit #1 or #2	STSC Unit 2	151
PVNGS	OSC dedicated phone to	STSC Unit 2	2119
PVNGS	Rad. Assessment Line phone	STSC Unit 2	2107
PVNGS	Shift Techical Advisor	STSC Unit 2	2207
PVNGS	Shift Technical Advisor	STSC Unit 2	2207
PVNGS	STSC Communicator	STSC Unit 2	2207
PVNGS	Technical Line phone	STSC Unit 2	2106
PVNGS	TSC dedicated phone to	STSC Unit 2	2120

Agency	Position	at Facility	Phone
PVNGS	Control Room dedicated phone to	STSC Unit 3	3110
PVNGS	Drill Controller	STSC Unit 3	3196
PVNGS	EC / EOD dedicated phone to	STSC Unit 3	3109
PVNGS	Emergency Coordinator	STSC Unit 3	3207
PVNGS	Environmental Assessment Line	STSC Unit 3	3108
PVNGS	EOF dedicated phone to	STSC Unit 3	3128
PVNGS	FAX STSC Unit 3 Circuit #1 or #2	STSC Unit 3	141
PVNGS	OSC dedicated phone to	STSC Unit 3	3119
PVNGS	Rad. Assessment Line phone	STSC Unit 3	3107
PVNGS	Shift Techical Advisor	STSC Unit 3	3207
PVNGS	Shift Technical Advisor	STSC Unit 3	3207
PVNGS	STSC Communicator	STSC Unit 3	3207
PVNGS	Technical Line phone	STSC Unit 3	3106
PVNGS	TSC dedicated phone to	STSC Unit 3	3120
PVNGS	Chemistry Coordinator	TSC	7001 / 7002
PVNGS	Drill Controller	TSC	2047
PVNGS	EC Technical Assistant	TSC	2560 / 2561
PVNGS	Electrical Engineering	TSC	2004
PVNGS	Emergency Coordinator	TSC	7043 / 7037
PVNGS	Emergency Maintenance Coordinator	TSC	7036
PVNGS	Environmental Assessment Line	TSC	6290
PVNGS	EOD dedicated phone to EC	TSC	6292 / 2560 2561
PVNGS	EOF to STA	TSC	6294 / 2028
PVNGS	FAX TSC	TSC	7044
PVNGS	FAX TSC Circuit #1	TSC	121
PVNGS	FAX TSC verification	TSC	7002
PVNGS	Maintenance Control Line	TSC	6291
PVNGS	Mechanical Engineering	TSC	7042
PVNGS	Operations Coordinator	TSC	7037 / 7043
PVNGS	Ops Coordinator to CR dedicated phone	TSC	6293
PVNGS	OSC dedicated phone to	TSC	6295
PVNGS	Plant Status Technician	TSC	2024
PVNGS	Probabilistic Risk Assessment	TSC	2008
PVNGS	Radiological Assessment Line	TSC	6289
PVNGS	Radiological Protection Coordinator	TSC	7033 / 7045
PVNGS	Reactor Analyst	TSC	7025 / 7042
PVNGS	RP Support Technician	TSC	7045
PVNGS	Safety Analysis Engineer	TSC	2026
PVNGS	Security Access Control	TSC	2633
PVNGS	Security Director	TSC	7019 / 7022
PVNGS	Shift Technical Advisor	TSC	2028
PVNGS	STSC to Ops Coordinator dedicated phone	TSC	6296
PVNGS	Technical Engineering Manager	TSC	7023 / 7025
PVNGS	Technical Engineering Manager	TSC	6288
PVNGS	TSC Cellular phone	TSC	602-370-2744

Agency	Position	at Facility	Phone
PVNGS	USNRC Liaison Operations	TSC	2690
PVNGS	Remote Shutdown Panel	Unit 1 RSP	1235 / 6297
PVNGS	Remote Shutdown Panel	Unit 2 RSP	2235 / 6298
PVNGS	Remote Shutdown Panel	Unit 3 RSP	3235 / 6299
RMC	Radiation Management Consultants	Emergency Assistance	215-243-2990
SCE	Southern California Edison	Vice President	714-368-1480
SCE	Southern California Edison	Vice President / Site Manager	714-368-6255
State	FAX State EOC dedicated to	County EOC	602-275-1638
State	FAX State EOC to	County EOC	602-231-6231
State	FAX State EOC dedicated to	EOF	111
State	FAX JENC	JENC	602-231-6362
State	FAX State EOC dedicated to	JENC	602-231-6362
State	FAX County EOC to	State EOC	602-231-6271
State	FAX JENC to	State EOC	602-231-6231
State	FAX State EOC	State EOC	211
State	FAX State EOC	State EOC	201
State	FAX State EOC	State EOC	211
State	FAX verification	State EOC	602-244-0504
State	FAX JENC dedicated to	State TOC	602-231-6202
State	FAX State TOC	State TOC	602-231-6202
USNRC	USNRC Director of Site Operations	EOF	2766
USNRC	USNRC Emergency Response Coordinator	EOF	2766
USNRC	USNRC Environmental Dose Assessment Coordinator	EOF	2783
USNRC	USNRC Government Liaison Coordinator	EOF	2768
USNRC	USNRC PMCL Communicator	EOF	2771
USNRC	USNRC Protective Measures Coordinator	EOF	2760
USNRC	USNRC Reactor Safety Coordinator / Communicator	EOF	2721
USNRC	USNRC Safeguards Security Coordinator	EOF	2782
USNRC	USNRC Status Summary Coordinator / Communicator	EOF	6185
USNRC	USNRC Emergency Notification System	EOF, TSC, U1, U2, U3	700-571-6225
USNRC	FAX USNRC	Headquarters Operations Center Rockville, MD	301-816-5151
USNRC	USNRC	Headquarters Operations Center Rockville, MD	301-816-5100 301-951-0550
USNRC	Federal Telecommunications System	Health Physics Network	700-571-6232
USNRC	USNRC	JENC	602-231-6389
USNRC	USNRC	JENC	602-231-6213
USNRC	USNRC	JENC	602-231-6259
USNRC	USNRC	JENC	602-231-6371
USNRC	USNRC	JENC	602-231-6374
USNRC	Federal Telecommunications System	Local Area Network	700-571-6224
USNRC	Federal Telecommunications System	Management Counterpart Link	700-571-6230

Agency	Position	at Facility	Phone
USNRC	Federal Telecommunications System	Protective Measures Counterpart Link	700-571-6226
USNRC	USNRC	PVNGS resident inspectors	3736 / 5979 3737 / 2137
USNRC	Federal Telecommunications System	Reactor Safety Counterpart Link	700-571-6229
USNRC	USNRC	Region IV administrator Arlington, TX	817-860-8225
USNRC	USNRC	Region IV switchboard Arlington, TX	817-860-8100
USNRC	USNRC	STSC Simulator A	5008
USNRC	USNRC	STSC Unit 1	3194
USNRC	USNRC	STSC Unit 2	3195
USNRC	USNRC	STSC Unit 3	3196
USNRC	USNRC ENS / RSCL Communicator	TSC	6799
USNRC	USNRC Health Physics Specialist	TSC	2047
USNRC	USNRC Radiation Safety Coordinator	TSC	6294
USNRC	USNRC Reactor Safety Coordinator	TSC	2047
USNRC	USNRC Senior Resident Inspector	TSC	2691
Wells	Well Drilling	Campbell's Drilling, Inc.	602-263-8093
Wells	Well Drilling	Layne-Western Company	480-895-9404
WPPSS	WA Public Power Supply System	Primary	509-377-2880
WPPSS	WA Public Power Supply System	Secondary	509-377-8184

3.0 Phonetic Alphabet

3.1 The International Telecommunications Union standard phonetic alphabet (reference: http://www.itu.int/radioclub/rr/app24.htm)

Letter	Code word	Spoken as *
A	Alfa	Al Fah
B	Bravo	Brah Voh
C	Charlie	Char Lee or Shar Lee
D	Delta	Dell Tah
E	Echo	Eck Oh
F	Foxtrot	Foks Trot
G	Golf	Golf
H	Hotel	Hoh Tell
I	India	In Dee Ah
J	Juliett	Jew Lee Ett
K	Kilo	Key Loh
L	Lima	Lee Mah
M	Mike	Mike
N	November	No Vem Ber
O	Oscar	Oss Cah
P	Papa	Pah Pah
Q	Quebec	Keh Beck
R	Romeo	Row Me Oh
S	Sierra	See Air Rah
T	Tango	Tang Go
U	Uniform	You Nee Form or OO Nee Form
V	Victor	Vik Tah
W	Whiskey	Wiss Key
X	X-Ray	Ecks Ray
Y	Yankee	Yang Key
Z	Zulu	Zoo Loo

* The syllables to be emphasized are underlined

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-08	**002**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIP-07		17-027I	RADIOLOGICAL ASSESSMENT COMMUNICATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027J	PLANT STATUS TECHNICIAN	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027K	SECURITY COORDINATOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027M	GOVERNMENT LIASON	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Q	EMERGENCY OPERATIONS DIRECTOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027R	DOSE ASSESSMENT HEALTH PHYSICIST	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-07		17-027Y	SHIFT TECHNICAL ADVISOR	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIP-08		05-015	SUPV-STDS	H/DAWPS-BLDG	PW	1	
EPIP-08		17-027	DISTRICT-MANAGER	Y/BUCKEYE-APS-DIST-OFFICE	PW	1	MAIL TO STA. 6050, R DUNCAN UPDATES
EPIPS		00-000		C/SIM-A-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000		C/SIM-B-PW-INV	PW	5	DD DELIVERY ONLY
EPIPS		00-000	NRC DOCUMENT CONTROL DESK	DOCUMENT CONTROL DESK, US NUCLEAR REGULATORY COMMISSION, MAIL STATION PI-37, WASHINGTON, DC 20555-0001	PW	1	SEND CERTIFIED MAIL ONLY!

Remarks

REINSTATED

Quantity to be Reproduced	
PW 13	ST
57	

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-08	**002**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: E.W. MERSCHOFF, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	NRC RIV ERC	USNRC REGION IV, ATTN.: T.H. ANDREWS, 611 RYAN PLAZA DRIVE, SUITE 400, ARLINGTION, TX 76011	PW	2	SEND CERTIFIED MAIL ONLY!
EPIPS		00-000	CROZIER,D	X/STA-6050	PW	1	
EPIPS		00-000	DUNCAN,R	X/STA-6050	PW	1	
EPIPS		00-000	WOLFE,W	X/STA-6050	PW	1	
EPIPS		00-000	LINES,H	X/STA-7003	PW	1	
EPIPS		00-000	SMITH,D	X/STA-7294	PW	1	
EPIPS		00-000	IDE,W	X/STA-7605	PW	1	
EPIPS		00-000	SONTAG, M	X/STA-7997	PW	1	
EPIPS		00-000	GOODWIN,A	Y/ARIZONA RADIATION REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	LUTTON,J	Y/AZ RAD REG AGENCY 4814 S 40TH ST PHX AZ 85040	PW	1	
EPIPS		00-000	SPENCER,B	Y/MARICOPA CNTY DEPT OF EMERG MGMT 2035 N 52ND ST PHX AZ 85008	PW	1	
EPIPS		00-000	PORTER,J CAPTAIN	Y/MARICOPA CO SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 15	ST

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-08	**002**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		00-000	ARPIAO,J SHERIFF	Y/MARICOPA COUNTY SHERIFFS OFFICE 102 W MADISON PHX AZ 85003	PW	1	
EPIPS		00-000	BORDER,H	Y/PLNS & OPS AZ DIV OF EMERGENCY MGMT 5636 E MCDOWELL RD PHX AZ 85008	PW	1	
EPIPS		01-002		C/ANX-MN-REF-LIB	PW	1	
EPIPS		01-007		WRF-DDC	PW	1	
EPIPS		02-002		B/UII-OSB-REF-LIB	PW	1	
EPIPS		03-005		D/TSC-DDC	PW	1	
EPIPS		05-002B		A/UI-CR	PW	1	
EPIPS		05-006		A/UI-RP	PW	1	
EPIPS		05-011		A/UI-OSB-REF-LIB	PW	1	
EPIPS		05-022		C/ADM-BLDG-II-LIB	PW	1	
EPIPS		05-025		B/UII-CR	PW	1	
EPIPS		05-036	MGR	C/EOF-DW-EMER-PLAN	PW	1	
EPIPS		05-039		H/UIII-CR	PW	1	
EPIPS		05-095		B/UII-RP	PW	1	
EPIPS		05-098		A/UI-REM-SHDWN	PW	1	

Remarks

REINSTATED

Quantity to be Reproduced	
PW 15	ST

For Questions Contact NIRM

x6131 m.s. 7720

Nuclear Information and Records Management Transmittal

Procedure Number	Revision #	Effective Date
EPIP-08	**002**	**09-15-99**

Document #	Critical Area	Control	Custodian	Location	Paper	Quantity	Remarks
EPIPS		05-127		B/UII-REM-SHDWN	PW	1	
EPIPS		05-132		H/UIII-REM-SHDWN	PW	1	
EPIPS		05-136		H/UIII-RP	PW	1	
EPIPS		06-010A		C/SIM-A	PW	1	
EPIPS		06-011		C/SIM-B	PW	1	
EPIPS		08-001		C/ANX-MN-NRC	PW	1	
EPIPS		12-002		D/SERVICE-BLDG	PW	1	
EPIPS		12-003	WOLFE,B	X/STA-6050	PW	2	JENC
EPIPS		15-001	SGT-OFFICE	D/SEC-BLDG	PW	1	
EPIPS		15-002	CAS	D/SEC-BLDG	PW	1	
EPIPS		15-003	SAS	D/SEC	PW	1	
EPIPS		17-001		C/ANX-DW-EOF-LIB	PW	1	
EPIPS		18-001		H/UIII-OSB-REF-LIB	PW	1	

Remarks
REINSTATED

Quantity to be Reproduced	
PW 14	ST

For Questions Contact NIRM

x6131 m.s. 7720

PROCEDURE INTENT

This procedure establishes guidelines for the following functions:

- Review, update, and approval of Emergency Plan Implementing Procedures, Joint Public Information Procedures, and the Emergency Plan, in accordance with 10 CFR 50.54(q)
- Development, conduct, evaluation, and documentation of emergency preparedness drills and exercises
- Instruction and testing of onsite and offsite Emergency Response Organization (ERO) personnel in the use of equipment, communications, plans, procedures, and management commitments
- Testing of equipment, communications, plans, procedures, and management commitments
- Response instructions for inadvertent siren system activation or other equipment malfunction
- Operational readiness and availability of equipment required for implementation of the PVNGS Emergency Plan
- Verify the adequacy of the PVNGS Emergency Plan, procedures, and effectiveness of both onsite and offsite emergency preparedness
- Document storage and retention requirements in accordance with ANSI N45.2.9-1974

rev	description
2	This revision incorporates elements from previous revisions of the following procedures:

Procedure	Title
16DP-0EP10	E-Plan Training Program Description
16DP-0EP11	Emergency Planning Administration
16DP-0EP12	Emergency Planning Equipment Malfunction
16DP-0EP17	Emergency Operations Facility Actions
16TD-0EP052	Emergency Kit Inventory
16TD-0EP091	Inadvertent Siren System Activation
16TD-0EP141	Notification Alert Network Testing
16TD-0EP151	Offsite Siren System Activation Testing
16TD-0EP162	PVNGS EP Scenario Development

TABLE OF CONTENTS

1.0 Introduction

1.1 Scope

This procedure establishes guidelines for the following functions:

- Review, update, and approval of Emergency Plan Implementing Procedures, Joint Public Information Procedures, and the Emergency Plan, in accordance with 10 CFR 50.54(q)
- Development, conduct, evaluation, and documentation of emergency preparedness drills and exercises
- Instruction and testing of onsite and offsite Emergency Response Organization (ERO) personnel in the use of equipment, communications, plans, procedures, and management commitments
- Testing of equipment, communications, plans, procedures, and management commitments
- Response instructions for inadvertent siren system activation or other equipment malfunction
- Operational readiness and availability of reserves required for implementation of the PVNGS Emergency Plan through maintenance of equipment and supplies
- Verify the adequacy of the PVNGS Emergency Plan, procedures, and effectiveness of both onsite and offsite emergency preparedness
- Document storage and retention requirements in accordance with ANSI N45.2.9-1974

1.2 Responsibilities

Onshift Operations management is responsible for contacting Emergency Planning department when notified of a failure of the offsite siren system.

The Program Leader - Emergency Planning (or designee) shall be responsible for the coordination of the following activities:

- Review and approval of the PVNGS Emergency Plan, Emergency Plan Implementing Procedures, and Joint Public Information Procedures
- Assurance that 10 CFR 50.54(q) screening requirements have been completed prior to revision of the PVNGS Emergency Plan and/or the creation, revision, or cancellation of Emergency Plan Implementing Procedures or the Joint Public Information Procedures
- Appropriate development, review, approval, conduct, evaluation, and documentation of applicable emergency preparedness related tests, training drills, evaluated drills, and exercises
- Approval of objectives / extent-of-play regarding applicable drills and exercises in conjunction with offsite agencies, if applicable
- Submittal of evaluated exercise scenarios to the USNRC and FEMA when requested
- Verification that PVNGS Emergency Kits are maintained in a state of operational readiness and availability for emergency events
- As appropriate, participation of Emergency Planning staff members as Facility Advisors
- Fulfillment of emergency preparedness document and storage requirements in accordance with ANSI N45.2.9-1974, Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants
- Fulfillment of emergency preparedness regulatory requirements

2.0 Procedure Review and Approval Limitations

2.1 The following elements identify the general limitations imposed by the procedure review and approval process:

2.1.1 01DP-0AP01, Procedure Process, shall be used as a basis for the review and approval of Emergency Plan Implementing Procedures and Joint Public Information Procedures.

2.1.2 Emergency Plan Implementing Procedures and Joint Public Information Procedures shall be reviewed and updated, if appropriate, biennially or more frequently if required by changing conditions.

2.1.3 The PVNGS Emergency Plan shall be reviewed annually and revised as necessary.

2.1.4 Written agreements listed in the PVNGS Emergency Plan shall be reviewed annually. This review shall normally be accomplished concurrently with the annual review of the PVNGS Emergency Plan.

2.1.5 Telephone numbers listed in the Telecommunications Technical Instruction shall be reviewed and updated, if appropriate, quarterly. Any changes required shall be initiated as soon as practicable following noted inconsistencies. Emergency Response Organization pager numbers, home phone numbers, work numbers, and station numbers should be reviewed and updated annually.

2.2 Screening Requirements

2.2.1 A 10 CFR 50.54(q) Screening per Section 3.0 of this procedure shall be completed for any of the following document actions prior to the document change:

2.2.1.1 Revision to the PVNGS Emergency Plan

2.2.1.2 Creation of Emergency Plan Implementing Procedures or Joint Public Information Procedures

2.2.1.3 Revision to Emergency Plan Implementing Procedures or Joint Public Information Procedures

2.2.1.4 Cancellation of Emergency Plan Implementing Procedures or Joint Public Information Procedures

2.2.2 Screening Basis

2.2.2.1 Screenings are performed to determine if the respective Evaluations are required for the document change. Creation, revision, or cancellation made to Emergency Plan Implementing Procedures or Joint Public Information Procedures as a result of a PVNGS Emergency Plan revision do not require a second 10 CFR 50.54(q) Screening or Evaluation.

2.2.3 Cross-Organization Reviews

2.2.3.1 Emergency Planning shall address cross-organization review comments received from reviewing disciplines during procedure revisions. In addition, Joint Public Information Procedures shall be reviewed by the following personnel:

- Joint Emergency News Center Facility Coordinator
- Joint Emergency News Center State / County / PVNGS Spokespersons
- Rumor Control Group Supervisor
- PVNGS Strategic Communications

2.2.4 USNRC Document Submittals

2.2.4.1 Emergency Planning shall verify that one copy of a revised Emergency Plan or revised Emergency Plan Implementing Procedure has been submitted to the USNRC in accordance with 10 CFR 50 requirements.

2.2.5 Biennial Review Requirements

2.2.5.1 During biennial reviews (full basis check) or revisions, consider the following items:

- Deficiencies in training, procedures, personnel performance, and equipment identified during training sessions, drills, and exercises
- Changes to personnel assignments within onsite or offsite Emergency Response Organizations
- Changes to state or federal regulations or policies
- Recommendations from industry organizations or agencies
- Modifications to the plant or site area
- Changes to facilities
- Changes in operational status or construction impact
- Results of federal, state, industry, or internal audits
- Changes resulting from revisions to the PVNGS Emergency Plan or other procedures
- 10 CFR 50.59 Screening / Evaluation requirements

3.0 10 CFR 50.54(q) Requirements

3.1 Abstract.

3.1.1 Per 10 CFR 50.54 (q): A licensee authorized to possess and operate a nuclear power reactor shall follow and maintain in effect emergency plans which meet the standards in 50.47(b) and the requirements in Appendix E of this part. A licensee authorized to possess and/or operate a research reactor or a fuel facility shall follow and maintain in effect emergency plans which meet the requirements in Appendix E to this part. The licensee shall retain the emergency plan and each change that decreases the effectiveness of the plan as a record until the Commission terminates the license for the nuclear power reactor. The nuclear power reactor licensee may make changes to these plans without Commission approval only if the changes do not decrease the effectiveness of the plans and the plans, as changed, continue to meet the standards of 50.47(b) and the requirements of Appendix E to this part. The research reactor and/or the fuel facility licensee may make changes to these plans without Commission approval only if these changes do not decrease the effectiveness of the plans and the plans, as changed, continue to meet the requirements of Appendix E to this part. This nuclear power reactor, research reactor, or fuel facility licensee shall retain a record of each change to the emergency plan made without prior Commission approval for a period of three years from the date of the change. Proposed changes that decrease the effectiveness of the approved emergency plans may not be implemented without application to and approval by the Commission. The licensee shall submit, as specified in 50.4, a report of each proposed change for approval. If a change is made without approval, the licensee shall submit, as specified in 50.4, a report of each change within 30 days after the change is made. [21 FR 355, Jan. 19, 1956, as amended at 28 FR 3197, Apr. 3, 1963; 58 FR 45243, Aug. 27, 1993; 59 FR 5519, Feb. 7, 1994; 59 FR 10267, Mar. 4, 1994]

3.2 Limitations

3.2.1 A 10 CFR 50.54(q) Screening is performed to determine if a 10 CFR 50.54(q) Evaluation is required for the creation, revision, or cancellation. The Evaluation will be performed for all PVNGS Emergency Plan revisions and any document creation, revision, or cancellation requiring a revision to the PVNGS Emergency Plan. 10 CFR 50.54(q) Evaluations are conducted to verify that revisions to the PVNGS Emergency Plan maintain compliance with federal regulations and do not decrease its effectiveness. The following types of Plan and procedure revisions do not impact the effectiveness of the PVNGS Emergency Plan:

- Telephone number and/or staffing assignment changes
- Facility floor plan modifications
- Changes to equipment inventory requirements
- Format changes or typographical error corrections
- Modifications that do not alter the intent of the PVNGS Emergency Plan. Intent is altered if the accomplishment or its method changes in a significant manner relative to regulatory standards, requirements, guidance, or to commitments addressed in the existing revisions of the Plan or procedures. If the proposed revision or cancellation causes a decrease in the effectiveness of the PVNGS Emergency Plan, the revision or cancellation and associated justification must be submitted to the US Nuclear Regulatory Commission for approval prior to implementation.

3.3 Process

3.3.1 Obtain the following forms for use in the 10 CFR 50.54(q) Screening and Evaluation process:

- Form EP-0760, 10 CFR 50.54(Q) Screening (see Appendix A - Forms)
- Form EP-0761, 10 CFR 50.54(Q) Evaluation (see Appendix A - Forms)

3.3.2 Complete Form EP-0760, 10 CFR 50.54(Q) Screening, and, if required, Form EP-0761, 10 CFR 50.54(Q) Evaluation (see Appendix A - Forms).

3.3.3 Submit completed form(s) to the Program Leader - Emergency Planning (or designee).

4.0 Training Drills / Evaluated Drills / Exercises

4.1 Abstract

4.1.1 10 CFR 50.47 states, in part, "...Periodic exercises are conducted to evaluate major portions of emergency response capabilities, and periodic drills are conducted to develop and maintain key skills." Moreover, 10 CFR 50, Appendix E.IV.F, details the specific requirements for training of Emergency Response Organization personnel. To further elaborate on these requirements, the following three Emergency Planning event types shall be used accordingly as defined references:

4.1.1.1 A Training Drill is a supervised period of instruction. Controller / Participant interface, i.e., coaching, prompting, is allowed to enhance essential skills. No portion of this drill may be used to demonstrate compliance with periodic assessment requirements, i.e., objective related evaluation. Objectives are applied as performance measures and results are used as "lessons learned" in future training drills.

4.1.1.2 An Evaluated Drill is a measured assessment of a specified portion of emergency response capabilities. Controller / Participant interface, i.e., coaching, prompting, casual conversation, is not allowed. This drill may be used to demonstrate compliance with periodic assessment requirements, i.e., objective related evaluation.

4.1.1.3 An Exercise is a measured assessment of major portions of emergency response capabilities. Controller / Participant interface, i.e., coaching, prompting, casual conversation, is not allowed. This event type may be used to demonstrate compliance with periodic assessment requirements, i.e., objective related evaluation.

4.1.1.4 The performance of all three event types shall provide for critiqued feedback.

4.1.2 Provisions of Implementation

4.1.2.1 The following provisions apply to all Emergency Planning drills and exercises:

- All training drills, evaluated drills, and exercises should be scheduled and conducted to minimize conflicts with normal plant operations.
- If practicable, training drills, evaluated drills, and exercises should be scheduled in conjunction with applicable onsite / offsite response organizations and with the Licensed Operator Training Organization.
- Evaluated drills and exercise scenarios shall be developed in conjunction with participating response organizations. Scenario content should vary from exercise to exercise such that all major elements, i.e., Planning Standards, of the PVNGS Emergency Plan are tested within a six-year period.
- Objectives, the extent-of-play scheme, and the scenario for the biennial USNRC Evaluated Exercise shall be approved by the Program Leader - Emergency Planning (or designee) and submitted to the USNRC Regional Office and the Federal Emergency Management Agency within the time periods requested by those agencies prior to performance of the Evaluated Exercise.
- Communications capabilities shall be tested annually between PVNGS, federal and state emergency response organizations, and field assessment teams. These capabilities shall include notification aspects related to emergency response staffing. However, these tests may be performed in conjunction with an Evaluated Drill or Exercise and may be used to demonstrate compliance with periodic assessment requirements.

4.1.3 Drill and Exercise Requirements

4.1.3.1 Evaluated drills and exercises shall incorporate the following aspects:

- A Lead Controller will administer the Control Organization
- Players will be briefed on ground rules and safety considerations prior to commencement of the event
- Facility critiques will be conducted in accordance with 10 CFR 50 Appendix E.IV.F.2.g., i.e., "All training, including exercises, shall provide for formal critiques in order to identify weak or deficient areas that need correction. Any weaknesses or deficiencies that are identified shall be corrected."
- Corrective actions shall be implemented to address negative findings (i.e., deficiencies and weaknesses) noted during performance of the drill or exercise

4.1.3.2 Evaluated drills and exercise scenario manuals include the following elements:

- The basic objective(s) and appropriate evaluation criteria
- Date(s), time period, place(s), and participating organizations
- Simulated events
- Time schedule of real and simulated initiating events
- A narrative summary describing the conduct of the exercise or drills to include such things as simulated casualties, offsite fire department assistance, rescue of personnel, use of protective clothing, deployment of radiological monitoring teams, and public information activities

4.1.4 Drill and Exercise Findings

4.1.4.1 Performance related issues resulting from the conduct of training drills shall be dispositioned in accordance with Emergency Response Organization training practices and requirements, e.g., remediation, critique, lessons learned, briefing. Findings identified during performance of evaluated drills and exercises shall be appropriately categorized comparable to USNRC methodology and shall conform to the following guidance:

- Deficiencies will be identified in accordance with 10 CFR 50.54(s)(2)(ii) ["If after April 1, 1981, the NRC finds that the state of emergency preparedness does not provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency (including findings based on requirements of Appendix E, Section IV.D.3) and if the deficiencies (including deficiencies based on requirements of Appendix E, Section IV.D.3) are not corrected within four months of that finding, the Commission will determine whether the reactor shall be shut down until such deficiencies are remedied or whether other enforcement action is appropriate. In determining whether a shutdown or other enforcement action is appropriate, the Commission shall take into account, among other factors, whether the licensee can demonstrate to the Commission's satisfaction that the deficiencies in the plan are not significant for the plant in question, or that adequate interim compensating actions have been or will be taken promptly, or that there are other compelling reasons for continued operation."]. Deficiencies will generally correspond to findings in which the licensee's demonstrated state of emergency preparedness does not provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Deficiencies can be identified due to one or more major emergency preparedness programmatic failures.

- Weaknesses will be identified as findings in which the licensee's demonstrated level of preparedness could have precluded effective implementation of the Emergency Plan in the event of an actual emergency. Weaknesses generally correspond to the inability to satisfy those objectives which relate to and are evaluated in accordance with regulatory criteria.

- Findings classified as strengths are exempt from categorization and need not be dispositioned.

4.1.5 Disposition of Findings

4.1.5.1 The evaluation and tracking of all drill and exercise findings shall use the following process:

1. Review all comments and objective evaluation forms (Controller Debrief).

2. Screen all comments for validity.

3. Identify the valid comments which satisfy CRDR thresholds and issue the appropriate CRDR(s) per 90DP-0IP03, Condition Report Screening and Processing. Comments that individually satisfy a CRDR threshold should appropriately be entered into individual CRDRs. Those which do not may be grouped together on one Review CRDR.

4. Provide feedback to the originator on the remaining comments, if requested.

4.2 Biennial Exercise Requirements

4.2.1 An exercise of the PVNGS Emergency Plan shall be conducted every two years and may be included in the biennial offsite plan exercise. Necessary actions shall be taken to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, at least one of which involves a combination of some of the principle functional areas of onsite emergency response capabilities. These functional areas include the following activities:

- Management and coordination of emergency response
- Accident assessment
- Protective action decision-making
- Plant system repair with corrective actions

4.2.2 State and local government agencies located within the plume exposure pathway Emergency Planning Zone (EPZ) shall be offered the opportunity to participate in drills when requested by the agencies. Activation of all emergency response facilities is not necessary during these drills. The following aspects should be addressed:

- The opportunity for accident management strategies is afforded
- Supervised instruction is permitted
- The opportunity for operating staff to resolve problems (success paths) in lieu of Controller intervention is provided
- The focus of the drills is on training objectives

4.3 Biennial Exercise Criteria

4.3.1 The Biennial Evaluated Exercise must satisfy, as a minimum, all of the following seven criteria:

1. The exercise must be an exercise and not a drill. In an exercise, player performance is observed and noted by evaluators for critique purposes; there is no coaching by non-players.
2. The exercise involves major elements of the Emergency Plan. Most or all of the emergency response facilities (ERFs) are activated.
3. The exercise tests the integrated capability of the licensee to implement the Emergency Plan.
4. A unique scenario is developed for the exercise.
5. In addition to a Federal evaluation, the licensee performs a self-assessment of the exercise. A critique is conducted to identify strengths and weaknesses. Corrective actions are developed and implemented to address identified weaknesses.
6. State and local organizations are offered the opportunity to participate in the exercise.
7. Utility documentation of the exercise and how it met these criteria must be available for examination by USNRC inspectors.

4.4 Training Drill / Evaluated Drill / Exercise Frequency Requirements

4.4.1 Training Drills

4.4.1.1 Facility: not required - scheduled per Simulator / classroom / personnel availability or as needs arise based on performance history or procedure and duty responsibility familiarization

4.4.1.2 Table-top: not required - scheduled per availability of personnel and resources based on performance history or procedure and duty responsibility familiarization

4.4.2 Evaluated Drills

4.4.2.1 Assembly: 6-year - performed in conjunction with Security personnel - involves Accountability activities

4.4.2.2 Radiological Monitoring: annual - environmental drill involving onsite soil / vegetation deposition sampling

4.4.2.3 Full-Scale: biennial - scheduled in years between Evaluated Exercises per Simulator / classroom / personnel availability or as needs arise based on performance history or procedure and duty responsibility familiarization

4.4.2.4 Health Physics: semi-annual - can be performed in conjunction with the Biennial Exercise or Full-Scale Drill - both of the following per calendar year, one in each half:

- PASS: satisfies liquid sampling requirements
- Radiological: satisfies airborne sampling requirements - performed with onsite / offsite survey teams

4.4.2.5 Medical: annual - conducted with offsite medical and transportation facilities - involves care of contaminated injured individuals

4.4.3 Exercises

4.4.3.1 Evaluated: biennial - scheduled per availability of the Simulator and plant personnel in conjunction with federal, state, and county authorities - evaluated by Federal agencies and self-assessment audit teams - must satisfy the seven criteria delineated in Section 4, Provisions of Implementation, of this document - documentation of actual events may be used in lieu of Exercise performance based on request to NRR with subsequent approval

4.4.3.2 IPZ: 6-year - ingestion pathway involving offsite agency response - full-scope 2-day event

4.5 Scenario Development

4.5.1 84DP-0RM32, Handling of Proprietary, Confidential, and Company Confidential Information, controls confidentiality requirements for drill and exercise data and material. These requirements become void following performance of the applicable drill or exercise to which they pertain.

4.5.2 Scenario development data and/or material shall not be maintained on a shared server or workstation when that data or material is controlled by 84DP-0RM32, Handling of Proprietary, Confidential, and Company Confidential Information. The maintenance of scenario development data and/or material should occur on personal computers configured with CMOS boot password protection when equipped with fixed and/or removal storage media. It is the responsibility of the data developer to ensure no compromise or potential compromise of the data. exists.

4.5.3 Scenario development personnel or individuals engaged in support of scenario development should read, sign, and date Form EP-0774, Scenario Development Data Confidentiality (see Appendix A - Forms), prior to initial exposure and/or access to confidential data and/or materials. As required, completed forms shall be stored and maintained in accordance with the Emergency Planning Document Storage and Retention requirements as specified in Emergency Planning administration guidance.

4.5.4 The list of objectives upon which to base scenario actions shall be extracted from the Master List of Emergency Planning Objectives. Objectives shall be demonstrated within the applicable time periods as specified.

4.5.5 The PVNGS Emergency Planning Controller Training and Information Manual should be reviewed by all Controllers prior to a major drill or exercise.

4.5.6 Collaboration with state and county personnel during the Full-Scale Drill and Evaluated Exercise development process should be employed when feasible.

4.5.7 Lead times may be required for certain aspects of scenario data development and should be taken into consideration during the development process.

4.5.8 The scenario development process routinely involves joint participation of many onsite and offsite departments and organizations. It is imperative that those departments and organizations identified as vital to the process be contacted as soon as possible. As required, individuals from these organizations should be employed as Scenario Task Force (STF) members.

4.5.9 Training sessions and briefings to organization participants should be conducted, as required, in accordance with Federal regulations and/or management needs.

4.6 External Organizational Support

4.6.1 The amount and type of external organizational support required for the production of technically accurate and complete scenario support data varies with each drill and exercise. For this reason, it is essential that early formation of the Scenario Task Force occur to provide the adequate time and resources necessary for the amount and type of support needed. Each aspect of the scenario should be reviewed in detail by the STF as soon as possible to help determine which onsite and offsite organizational abilities will be required for the remainder of the development cycle. Additionally, the onsite and offsite support organizations required for drill and exercise development support should not be limited to those directly affected by postulated scenario actions. If data development is required to support other actions contained in the scenario, the organizational expertise should be solicited. This support data will be used to establish a basis for the scenario actions which require justification.

4.6.2 Typical organizational support required for scenario data development includes, but is not limited to, operational, radiochemistry, radiological (e.g., plume exposure pathway, ingestion exposure pathway, radiation, contamination, etc.) reactor physics, meteorological, hazardous chemical, fire related, medical, mechanical, electrical, communications, law enforcement, governmental, and training. These, and others, should always be reviewed for applicability early in the scenario development process.

4.6.3 The methodology used by the STF to employ external organizational support will vary with the requirements of the data. The following organizational support areas are routinely used for all major drill and exercise development projects and, as such, should always be represented on the STF membership:

- Operational
- Operations training
- Radiochemistry
- Radiological
- Meteorological
- Governmental

4.6.4 The following organizations should provide concurrence of the scenario:

- PVNGS Operations
- PVNGS Licensed Operator Training
- PVNGS Radiation Protection
- Arizona Division of Emergency Management (ADEM)

4.7 The following PVNGS Emergency Planning forms (see Appendix A - Forms), or their equivalent, should be used as required during the drill or exercise development process:

- EP-0770, Full-Scale Drill / Exercise Checklist (see Appendix A - Forms)
- EP-0773, Training Drill Checklist (see Appendix A - Forms)
- EP-0774, Scenario Development Data Confidentiality (see Appendix A - Forms)

4.8 Form EP-0770, Full-Scale Drill / Exercise Checklist (see Appendix A - Forms), should be used for Full-Scale Drill and Evaluated Exercise development projects. Though the sequence of timeline activities associated with each drill and exercise may vary slightly, the form represents a sequenced timeline of events which should occur in the approximate order listed on the form.

4.9 Form EP-0773, Training Drill Checklist (see Appendix A - Forms), should be used for Emergency Response Organization (ERO) training sessions or mini-drills involving partial or full activation of onsite emergency response facilities. These sessions typically continue for 2 to 3 hours.

4.10 Form EP-0774, Scenario Development Data Confidentiality (see Appendix A - Forms), should be employed for scenario development personnel or individuals engaged in support of Full-Scale Drill and Evaluated Exercise scenario development. Its use is optional for training session and mini-drill scenario development.

4.11 For Full-Scale Drill and/or Evaluated Exercise development, complete Forms EP-0770, Full-Scale Drill / Exercise Checklist, and EP-0774, Scenario Development Data Confidentiality (see Appendix A - Forms), as required.

4.12 For Emergency Response Organization (ERO) training sessions or mini-drills involving partial or full activation of onsite emergency response facilities, complete Form EP-0773, Training Drill Checklist, as required. Completion of Form EP-0774, Scenario Development Data Confidentiality, is optional (see Appendix A - Forms).

4.13 Collect completed Forms EP-0774 (see Appendix A - Forms), Scenario Development Data Confidentiality, and maintain in accordance with the Emergency Planning Document Storage and Retention requirements specified in Emergency Planning administration guidance.

5.0 Equipment Testing

5.1 Overview

5.1.1 Equipment testing should be scheduled and conducted to minimize conflicts with normal plant operations.

5.1.2 Communications Equipment Testing

5.1.2.1 ERDS: quarterly - scheduled for eleventh week of each calendar quarter - involves Control Room link verification to USNRC Operations Center from each PVNGS Unit

5.1.2.2 NAN: monthly - tested by Operations - failures reported to Emergency Planning

5.1.2.3 Department State / County: quarterly - communications links tested by Emergency Planning Department

5.1.2.4 USNRC: monthly - tested by Emergency Planning Department from Unit Control Rooms, TSC, and EOF - failures reported to USNRC Operations Center

5.1.3 Offsite Siren Warning System Testing

5.1.3.1 Activation: annual - conducted by Arizona Division of Emergency Management (ADEM) - APS Communications and Construction and Emergency Planning participate - malfunctions reported to APS Communications and Construction - Emergency Planning prepares / submits report to ADEM, who forwards to Federal Emergency Management Agency (FEMA)

5.1.3.2 Growl: quarterly - conducted by APS Communications and Construc-tion - Emergency Planning notified of test scope and schedule - test results / failures reported to Emergency Planning

5.1.3.3 Silent: monthly - conducted by Maricopa County Department of Emergency Management (MCDEM), Maricopa County Sheriff's Office (MCSO), and Arizona Department of Public Safety (DPS) - test results / failures reported to Emergency Planning

5.1.4 Uninterruptible Power Supply Testing

5.1.4.1 Dose Assessment: quarterly - tested for UPS-equipped dose assessment computers - test conducted by Emergency Planning

5.2 Notification Alert Network Testing

5.2.1 The Notification Alert Network (NAN) is comprised of a dedicated telephone and a radio network used to notify offsite agencies (state and county) of the declaration of any emergency classification by PVNGS personnel. Capabilities to notify offsite agencies of an emergency event at PVNGS within 15 minutes of declaring an emergency classification is required by 10 CFR 50 APP E.IV.D.3 ["A licensee shall have the capability to notify responsible State and local governmental agencies within 15 minutes after declaring an emergency. The licensee shall demonstrate that the State/local officials have the capability to make a public notification decision promptly on being informed by the licensee of an emergency condition. By February 1, 1982, each nuclear power reactor licensee shall demonstrate that administrative and physical means have been established for alerting and providing prompt instructions to the public within the plume exposure pathway EPZ. The four-month period in 10 CFR 50.54(s)(2) for the correction of emergency plan deficiencies shall not apply to the initial installation of this public notification system that is required by February 1, 1982. The four-month period will apply to correction of deficiencies identified during the initial installation and testing of the prompt public notification systems as well as those deficiencies discovered thereafter. The design objective of the prompt public notification system shall be to have the capability to essentially complete the initial notification of the public within the plume exposure pathway EPZ within about 15 minutes. The use of this notification capability will range from immediate notification of the public (within 15 minutes of the time that State and local officials are notified that a situation exists requiring urgent action) to the more likely events where there is substantial time available for the State and local governmental officials to make a judgment whether or not to activate the public notification system. Where there is a decision to activate the notification system, the State and local officials will determine whether to activate the entire notification system simultaneously or in a graduated or staged manner. The responsibility for activating such a public notification system shall remain with the appropriate governmental authorities."].

5.2.2 Testing of the Notification Alert Network should be consistently performed on the same day each week to facilitate Test Performance Schedule compliance.

5.2.3 Each Unit shall perform the NAN Primary Circuit Test at least once per month. The NAN Primary Circuit Test shall rotate through a specified Unit each calendar week (different Unit each week) and this rotation is reserved for the first 3 weeks of each month. The NAN Radio Backup Test shall rotate through all 3 Units each calendar quarter and is reserved for week 4 of each month (different Unit each month). No testing will be conducted in week 5 of a calendar month.

5.2.4 Test performance should be alternated between Day Shift and Night Shift per the Test Performance Schedule. Day Shift testing should be avoided between the hours of 1100 and 1300.

5.2.5 Meteorological information is obtained from ERFDADS by selecting "TOP MENU" located at the lower left corner of the display, then selecting "P&ID DISPLAYS", and then selecting "MET DATA." If ERFDADS is inoperable, meteorological information required on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix A - Forms), should be estimated by Operations Supervision and entered on the form appropriately.

5.2.6 During performance of the NAN Primary Circuit Test or the NAN Radio Backup Test, complete the "Date / Time / Initials" columns for those agencies contacted. (Certain agencies may not respond on backshifts or weekends.)

5.2.7 If one or more of the responding agencies does not acknowledge following Sheriff's Office readback and acknowledgement roll call, contact agency via Alternate Link listed on Form EP-0541, Palo Verde NAN Emergency Message form (see Appendix A - Forms).

5.2.8 For test performance using the NAN Radio Backup, the radio located in the Unit Control Room or the Satellite Technical Support Center can be used.

5.2.9 White Authenticator Code envelopes shall be used for the tests. (Do not use the colored envelopes.) Each envelope is dated for the month designating its use and each Authenticator Code within an envelope shall be used for one calendar month. When a calendar month has elapsed and all testing has been completed for that specified month, the designated Authenticator Code may be discarded.

5.2.10 All NAN tests shall be documented on Form EP-0740, NAN Communications Test (see Appendix A - Forms). The form should be completed by the individual performing the test and forwarded to Emergency Planning, Mail Station 6050.

5.2.11 If one or more of the responding agencies does not acknowledge following Sheriff's Office readback and acknowledgement roll call during performance of the NAN Primary Circuit Test or the NAN Radio Backup Test, contact Emergency Planning on their next scheduled work day. Telecommunications equipment malfunctions shall be documented on a Work Request to MCC at Mail Station 6305.

5.2.12 Completing the form

5.2.12.1 Obtain the white Authenticator Code envelope for the current month from the wall key box in the Shift Supervisor's office and remove the code from the envelope. (Do not use an Authenticator Code in a colored envelope.)

5.2.12.2 Obtain Form EP-0541, Palo Verde NAN Emergency Message (see Appendix A - Forms).

NOTE

Do not complete Step 2 of the form at this time.

5.2.12.3 Complete Steps 1, 4, and 6 of the form. (Use ERFDADS to obtain meteorological information required for Step 4 on the form. If ERFDADS is inoperable, Control Room Supervision should estimate the data and enter it on the form.)

5.2.12.4 Request Control Room Supervision to complete Steps 3 and 5 of the form using the following information:

- Step 3: Circle UNUSUAL EVENT, enter Unit, current time, and current date, and enter PVNGS Emergency Status Code 2-1.
- Step 5: Circle NO Radioactive Release, and check "There are no Protective Actions Required."

5.2.12.5 Request Control Room Supervision to review and sign the form.

5.2.13 Determining the system to test

5.2.13.1 Determine the appropriate "SYSTEM TO TEST" per the Test Performance Schedule in Section 5.2.16 of this document.

5.2.13.2 Proceed to the appropriate test block in this document per the following:

- For NAN Primary Circuit Test, go to Section 5.2.14 of this document.
- For NAN Radio Backup Test, go to Section 5.2.15 of this document.

5.2.14 Conducting the NAN Primary Circuit Test

5.2.14.1 Pick up the receiver on the NAN phone, push the red button for 5 seconds, and record the time in Step 2 of the form. Allow 30 seconds for all stations to access the phone.

5.2.14.2 Announce the following message:

"STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

Repeat message once.

5.2.14.3 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

5.2.14.4 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix A - Forms).

5.2.14.5 Announce the following message:

"STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

5.2.14.6 When all agencies acknowledge receipt of the message, announce the following message:

"END OF MESSAGE."

5.2.14.7 Hang up the NAN Primary Circuit Telephone.

5.2.14.8 If one or more of the responding agencies does not acknowledge following Sheriff's Office readback and acknowledgement roll call, note as "unsat" on Form EP-0740, NAN Communications Test form (see Appendix A - Forms), contact agency via Alternate Link listed on Form EP-0541, Palo Verde NAN Emergency Message form (see Appendix A - Forms), and document results under "COMMENTS."

5.2.14.9 Inform Control Room Supervision that the NAN Primary Circuit Test has been completed.

5.2.14.10 Complete Form EP-0740, NAN Communications Test (see Appendix A - Forms), and forward the form to Emergency Planning, Mail Station 6050.

5.2.15 Conducting the NAN Radio Backup Test

5.2.15.1 Using the NAN Radio Backup in the Satellite Technical Support Center (preferred) or in the Control Room, press the "Mode" button until the display indicates "NANB/U 18". (An alternate method to reach this status is to press the "Home" button until the unit audibly beeps. Then enter 18 on the key pad and press the "Sel" key.)

5.2.15.2 Press the "Page" button.

5.2.15.3 Press the "Mode" button until the display indicates "GOVT AGENCY". (The display will alternate between "GOVT AGENCY" and "ID - 755867".)

5.2.15.4 Press the "Sel" button. This action sends a page to all government agencies offsite.

5.2.15.5 Wait for the 4-beep acknowledgment signal. This action indicates that offsite desk sets have acknowledged the page.

5.2.15.6 Press "Home" to return the display to "NANB/U 18".

5.2.15.7 Record the time in Step 2 of the form.

5.2.15.8 Key the radio microphone and announce the following message:

"ALL STATIONS THIS NET, ALL STATIONS THIS NET. THIS IS PALO VERDE TO ALL STATIONS. STAND BY FOR WARNING-POINT ROLL CALL. ALL STATIONS OBTAIN COPY OF PALO VERDE NAN EMERGENCY MESSAGE FORM."

5.2.15.9 After a 30-second waiting period, repeat the preceding message.

5.2.15.10 Announce each NAN agency name and have each agency acknowledge prior to announcing the next agency name.

5.2.15.11 When all agencies have acknowledged, read aloud Steps 1-6 on Form EP-0541, Palo Verde NAN Emergency Message (see Appendix A - Forms).

5.2.15.12 Announce the following message: "STAND BY FOR ACKNOWLEDGMENT ROLL CALL. DID YOU COPY?"

Call out NAN agency name. Ensure each agency acknowledges their copy. Allow time for the Sheriff's Office to repeat back the entire message prior to other agencies' acknowledgment. If an agency indicates "DOES NOT COPY", clarify the message and resume the roll call when the agency does copy.

NOTE

State the current time in the current time field using the 24-hour scheme.

5.2.15.13 When all agencies acknowledge receipt of the message, announce the following message:

"STATION CLEAR AT (current time). PALO VERDE OFF."

5.2.15.14 Inform Control Room Supervision that the NAN Radio Backup Test has been completed.

5.2.15.15 Complete Form EP-0740, NAN Communications Test (see Appendix A - Forms), and forward the form to Emergency Planning, Mail Station 6050.

5.2.16 Test Performance Schedule

MONTH	WEEK	SHIFT	UNIT	SYSTEM TO TEST
JAN, JUL	1	Day	1	NAN Primary
	2	Night	2	Circuit
	3	Day	3	NAN Primary
	4	Night	1	Circuit
				NAN Primary
				Circuit
				NAN Radio Backup
FEB, AUG	1	Night	1	NAN Primary
	2	Day	2	Circuit
	3	Night	3	NAN Primary
	4	Day	2	Circuit
				NAN Primary
				Circuit
				NAN Radio Backup
MAR, SEP	1	Day	1	NAN Primary
	2	Night	2	Circuit
	3	Day	3	NAN Primary
	4	Night	3	Circuit
				NAN Primary
				Circuit
				NAN Radio Backup
APR, OCT	1	Night	1	NAN Primary
	2	Day	2	Circuit
	3	Night	3	NAN Primary
	4	Day	1	Circuit
				NAN Primary
				Circuit
				NAN Radio Backup
MAY, NOV	1	Day	1	NAN Primary
	2	Night	2	Circuit
	3	Day	3	NAN Primary
	4	Night	2	Circuit
				NAN Primary
				Circuit
				NAN Radio Backup
JUN, DEC	1	Night	1	NAN Primary
	2	Day	2	Circuit
	3	Night	3	NAN Primary
	4	Day	3	Circuit
				NAN Primary
				Circuit
				NAN Radio Backup

6.0 Offsite Siren System Activation Testing

6.1 This section provides direction for performing the following task(s):

- Conducting the Silent Test
- Conducting the Growl Test
- Conducting the Activation Test

6.2 The Silent and Growl Tests are performed on a routine basis by organizations other than PVNGS Emergency Planning. The annual Activation Test is administered and coordinated by PVNGS Emergency Planning.

6.3 Within the scope of this guidance, the Program Leader - Emergency Planning, maintains the following responsibilities:

- Approval of the siren testing schedule
- Coordination, evaluation, and documentation of the siren tests
- Coordination of planning / scheduling for the annual Activation Test
- Ensuring appropriate corrective actions are designated to resolve deficiencies identified in the Silent and annual Activation Tests.

6.4 All siren tests are scheduled and conducted in a manner which satisfies the requirements of 10 CFR 50 - Appendix E and NUREG-0654. All tests shall be documented on pertinent forms and require no preliminary scenario outlines or Controller evaluation.

6.5 Conducting the Silent Test

6.5.1 This test is conducted by the Maricopa County Division of Emergency Management (MCDEM), the Maricopa County Sheriff's Office (MCSO), and the Arizona Division of Public Safety (DPS). The testing procedures are outlined in the INTRAC 2000 Controller Maintenance Procedure, which is updated and maintained by ADEM and MCDEM.

6.5.2 Ensure the test has occurred in accordance with scheduled activities.

6.5.3 Ensure test results are forwarded to PVNGS Emergency Planning.

6.5.4 If appropriate, report any test failures or anomalies to the Program Leader - Emergency Planning as soon as possible following the test.

6.6 Conducting the Growl Test

6.6.1 This test is conducted by APS Communications Systems personnel. The testing procedures are outlined in the Quarterly Maintenance Procedures maintained by APS Communications Systems.

6.6.2 Ensure PVNGS Emergency Planning has received notification by APS Communications Systems of the scope / time of the test.

6.6.3 Ensure the test has occurred in accordance with scheduled activities.

6.6.4 Ensure test results are forwarded to PVNGS Emergency Planning.

6.6.5 If appropriate, report any test failures or anomalies to the Program Leader - Emergency Planning as soon as possible following the test.

6.6.6 Ensure PVNGS Emergency Planning has received the completed Quarterly Growl Testing Form from APS Communications Systems for inclusion into the quarterly report forwarded to the Arizona Division of Emergency Management.

6.7 Conducting the Activation Test

6.7.1 This test is conducted by the Arizona Division of Emergency Management and is directed, supported, and coordinated by PVNGS Emergency Planning and APS Communications Systems. The Arizona Division of Emergency Management and the Maricopa County Division of Emergency Management may recruit volunteers to observe and independently verify siren operation during the activation test.

6.7.2 Ensure preliminary items on Form EP-0752, Offsite Siren Activation Planning (see Appendix A - Forms), have been completed.

6.7.3 Ensure that the Arizona Division of Emergency Management has dispatched the Communications Command Post to PVNGS and has established appropriate Radio Net Control operations at the site.

6.7.4 On the scheduled testing day, assemble all volunteers and provide them a briefing on siren testing activities planned by the organizations involved.

6.7.5 When volunteers have been briefed, assign siren testing locations to each and dispatch the teams to their assigned locations.

6.7.6 When on location, ensure each volunteer contacts Net Control to report their status and readiness for testing activities to initiate.

6.7.7 Ensure that Maricopa County Division of Emergency Management has initiated a countdown and that testing has commenced.

6.7.8 Ensure that all failures or anomalies are reported by the volunteers to Net Control after the initial test.

6.7.9 Ensure that a second countdown and siren activation has been initiated by MCSO or DPS from a designated alternate location.

6.7.10 Ensure that all failures or anomalies are reported by the volunteers to Net Control after the second test.

6.7.11 Ensure that team leaders have directed all volunteers to return to the designated assembly area after completion of both tests.

6.7.12 Instruct all volunteers to complete Form EP-0753, Offsite Siren Activation Verification, and convey them to a team leader.

6.7.13 Ensure Net Control has notified all activation locations of test completion.

6.7.14 Report all siren malfunctions to APS Communications Systems.

6.7.15 If appropriate, report any test failures or anomalies to the Program Leader - Emergency Planning as soon as possible following the test.

6.7.16 Ensure APS Communications Systems initiates monitoring and tracking actions via the INTRAC 2000 print report for any malfunctions. This system interrogates the EPZ sirens twice daily at 0600 and 1800 for operational status.

6.7.17 Ensure all reported malfunctioning sirens have been retested within two working days following their repair.

6.7.18 If an extended siren outage occurs, notify the Maricopa County Sheriff's Office for alternate required actions.

6.7.19 Prepare and submit a Quarterly and an Annual Report to the Arizona Division of Emergency Management.

6.7.20 Ensure that the Arizona Division of Emergency Management submits a report to the Federal Emergency Management Agency describing the results of the Annual Siren Activation Test.

7.0 Emergency Kit Maintenance

7.1 Inventory Requirements

7.1.1 Emergency Kits shall be inventoried immediately following any event which breaches the integrity of the kit, i.e., designating equipment usage, or each calendar quarter, whichever is most limiting. NATM Procedures contained in the ERO Position Manuals are maintained current by Nuclear Information Records Management (NIRM) personnel, but shall be inventoried in conjunction with the Emergency Kit to ensure all NATM Procedures are of current issue. Equipment shall not be substituted unless specifically approved by the Program Leader - Emergency Planning (or designee).

7.2 Calibration and Instrument Checks

7.2.1 Emergency Plan Dose / Dose Rate equipment is calibrated on a 6-month cycle. Air sampling equipment is calibrated annually. Replacement of this equipment shall occur prior to the next calibration due date shown on each item. Equipment used in an emergency event must be returned to the calibration facility for calibration and required maintenance, if necessary. However, sufficient reserves of required instrumentation / equipment shall be available to replace those which are removed for calibration or repair. Operational checks of radiation survey and monitoring instrumentation shall be performed at quarterly inventory intervals. The operational checks shall include the radiological check source test and the internal battery test, if so equipped. Check source tests will also be performed on instrumentation during an emergency event.

7.3 Kit Inventory Process

7.3.1 The following Emergency Kits shall be inventoried immediately following use or each calendar quarter, whichever is most limiting:

- 2 - Ambulance (Fire Department / Medical Center)
- 1 - Backup Emergency Operations Facility
- 1 - Emergency Operations Facility
- 1 - Offsite Decontamination (Buckeye Airport)
- 2 - Offsite Hospitals (Good Samaritan / Maryvale)
- 3 - Operations Support Center (1 per Unit)
- 3 - Radiological Field Assessment Team Vehicles (maintained in Building E)
- 4 - Satellite Technical Support Center (1 per Unit and Simulator-A)
- 1 - Site Medical Center (Building F)
- 2 - Soil Sampling (maintained in Building E)
- 1 - Technical Support Center

7.3.2 Noteworthy Items

7.3.2.1 All Emergency Kits should have a seal affixed at the access point to the kit. For kits employing a locking device, e.g., padlock, at the access point, a kit seal should be installed in addition to the locking device to maintain positive access control for Emergency Kit inventory purposes.

7.3.2.2 Ensure that the Silver Zeolite (AgX) cartridges are maintained in an airtight wrap. Any cartridges found otherwise should be replaced.

7.3.2.3 Operational and battery checks should be performed on instrumentation employing that capability quarterly and prior to each use. Operational checks may be performed using the check sources in the kits. Ensure that all instrumentation is returned to the as-found condition after all checks have been performed and after each use. Spare batteries may be checked on a periodic basis using the battery tester included in some kits.

7.3.2.4 Out-of-calibration, expired, or missing required equipment or dosimetry should be replaced as soon as possible, preferably the same day of discovery. All other materials found deficient should be replaced within 5 days. ROS or other documentation used for solicitation should be attached to the inventory form if the deficient materials cannot be replaced within 5 days.

7.3.2.5 Perishable items maintained in the Buckeye Airport Emergency Kit should be replaced as the need arises, due to severe weather extremes placed upon them.

7.3.2.6 TLDs should not be stored in close proximity to the emergency kit check source.

7.3.2.7 Respirators do not possess expiration or due dates which require replacement by the individual performing the kit inventory. However, certain types of supplies stored in the Emergency Kit are classified as perishable and, as such, incorporate expiration dates affixed to them. When performing the inventory, the most limiting expiration date of all like supplies should be appropriately noted in the right column of the form.

7.3.2.8 Not all Emergency Kits / facilities contain ERO Position Manuals. For those that do, the current NATM Station Manual Index and the current Position Manual Cross-Reference should be used as a guide when the ERO Position Manual procedures, instructional guides, and forms are verified for accuracy. To be verified as acceptable, a given ERO Position Manual must contain current NATM Station Manual Procedures as specified in the current NATM Station Manual Index and current forms as specified on the appropriate Position Manual Cross-Reference page located behind the "Document Index" Tab in each ERO Position Manual. Ensure that the minimum required number of each document is available in each ERO Position Manual.

7.3.2.9 A "Check Box" Column is available on all inventory forms to aid as a place-keeper for the individual performing the inventory and does not signify that an acceptable quantity for the applicable item exists. The performer's signature toward the bottom of the form is used as documentation for inventory requirements.

7.3.2.10 Prior to inventory, ensure the following items are available:

- A copy of this document
- The inventory form appropriate for the Emergency Kit
- Several Emergency Kit seals
- Replacement materials, if required
- Emergency Kit locker keys, if required
- Replacement radiological instrumentation, if appropriate
- A copy of the current Position Manual Cross-Reference

7.3.3 Emergency Kits and Forms

7.3.3.1 Refer to the following list to determine which inventory form is appropriate as a record for each Emergency Kit (see Appendix A - Forms):

Emergency Kit	Form
• Ambulance (Fire Department)	EP-0701
• Ambulance (Medical)	EP-0702
• Backup EOF (APS Buckeye Office)	EP-0721
• Emergency Operations Facility	EP-0703
• Offsite Decontamination (Buckeye Airport)	EP-0704
• Offsite Hospital (Good Samaritan)	EP-0706
• Offsite Hospital (Maryvale)	EP-0707
• Operations Support Center (Unit 1)	EP-0708
• Operations Support Center (Unit 2)	EP-0709
• Operations Support Center (Unit 3)	EP-0710
• RFAT Vehicle #1 (maintained in Building E)	EP-0711
• RFAT Vehicle #2 (maintained in Building E)	EP-0712
• RFAT Vehicle #3 (maintained in Building E)	EP-0713
• Satellite Technical Support Center (Unit 1)	EP-0714
• Satellite Technical Support Center (Unit 2)	EP-0715
• Satellite Technical Support Center (Unit 3)	EP-0716
• Satellite Technical Support Center (Simulator-A)	EP-0717
• Site Medical Center (Building F)	EP-0718
• Soil Sampling (maintained in Building E)	EP-0719
• Technical Support Center	EP-0720

7.3.4 Performing an Emergency Kit Inventory

7.3.4.1 Upon arrival at the kit location, inspect the area surrounding the kit and correct any discrepancies associated with kit accessibility.

7.3.4.2 Complete the top line and the VERIFICATION Section of the form.

7.3.4.3 Inventory the appropriate ERO Position Manuals (if applicable), correcting any discrepancies found.

7.3.4.4 Remove the Emergency Kit seal and access the kit.

7.3.4.5 Compare the contents of the kit with the inventory requirements stated on the applicable Emergency Kit Form. Complete the applicable entries in the RECORD Section of the form.

7.3.4.6 Review the Noteworthy Items in Section 7.3.2 of this document to ensure that all problems encountered are dispositioned appropriately.

7.3.4.7 When the inventory is completed, sign and date the form at the bottom.

7.3.4.8 Ensure that the completed Emergency Kit Form is submitted to the Program Leader - Emergency Planning for review (signature).

8.0 Document Storage and Retention Requirements

8.1 The requirements of ANSI N45.2.9-1974, Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants, apply to the work of any individual or organization that participates in collection, storage, or maintenance of quality assurance records associated with nuclear power plants. The requirements are intended to assure that records are available when needed for their intended purpose. Quality related records will be processed in accordance with 84DP-0RM30, Record Turnover Control.

8.2 The following tables are used to determine Emergency Planning document storage and retention requirements. ERO Position Walkthrough status is also available via the Training Records Management System (TRMS).

QUALITY RELATED LIFETIME RETENTION		
Document Type	EP Fire-proof Files	NIRM (w/i 120 days)
EP-0300 (Exposure Authorization)		X
EP-0503 (KI Distribution)		X
ERO Position Walkthrough		X
Onsite Training		X

NON QUALITY RELATED 3-YEAR RETENTION		
Document Type	EP Fire-proof Files	NIRM (w/i 120 days)
Declared Event	X	
EP-0013 (Duty Contact Register)	X	
EP-0742 (Quarterly Communications Test)		X
Evaluated Drill Report		X
Exercise Report		X
EP-0701 - EP-0720 (E-Kit Inventory)		X

QUALITY RELATED 5-YEAR RETENTION		
Document Type	EP Fire-proof Files	NIRM (w/i 120 days)
EP-0772 (Exer Participant Briefing Checklist)	X	
Offsite Training (non-Palo Verde)	X	

9.0 Emergency Planning Equipment Malfunction

9.1 The Program Leader - Emergency Planning (or designee) shall be responsible for the following:

- Administration of coordinated activities, including immediate notification to Nuclear Regulatory Affairs (if appropriate), regarding problems associated with emergency preparedness equipment
- To ensure that an expeditious return to service of that equipment is completed
- To assure continued support from organizations relied upon for notification to PVNGS Emergency Planning for problems associated with this equipment

9.2 PVNGS onsite emergency preparedness equipment includes, but is not limited to, the following system(s) and/or component(s):

- TSC and EOF backup diesel generators
- TSC and EOF heating and ventilation systems
- TSC and EOF area radiation monitors
- TSC and EOF miscellaneous equipment PVNGS Site-Wide Paging System
- PVNGS ERO Group Pager System (primary notification)
- PVNGS Emergency Voice Response System Autodialer (backup notification)

9.3 When notified of component or system malfunction regarding the Technical Support Center or Emergency Operations Facility backup diesel generator, perform the following action(s):

9.3.1 Notify the appropriate PVNGS Maintenance Department discipline of the problem. Describe the nature of the problem accurately.

9.3.2 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.3.3 Maintain subsequent follow-up actions to problem resolution.

9.3.4 Complete any required documentation associated with the problem and submit accordingly.

9.4 When notified of component or system malfunction regarding the Technical Support Center or Emergency Operations Facility heating and ventilation system, perform the following action(s):

9.4.1 Notify PVNGS Facility Services of the problem. Describe the nature of the problem accurately.

9.4.2 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.4.3 Maintain subsequent follow-up actions to problem resolution.

9.4.4 Complete any required documentation associated with the problem and submit accordingly.

9.5 When notified of component or system malfunction regarding the Technical Support Center or Emergency Operations Facility area radiation monitor RU-13A or RU-13B, perform the following action(s):

9.5.1 Notify PVNGS RMS Maintenance of the problem. Describe the nature of the problem accurately.

9.5.2 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.5.3 Maintain subsequent follow-up actions to problem resolution.

9.5.4 Complete any required documentation associated with the problem and submit accordingly.

9.6 When notified of component or system malfunction regarding the Technical Support Center or Emergency Operations Facility miscellaneous equipment, perform the following action(s):

9.6.1 Notify the appropriate discipline of the problem. Describe the nature of the problem accurately.

9.6.2 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.6.3 Maintain subsequent follow-up actions to problem resolution.

9.6.4 Complete any required documentation associated with the problem and submit accordingly.

9.7 When notified of component or system malfunction regarding the PVNGS Site-Wide Paging System, perform the following action(s):

9.7.1 Notify APS Communications Systems of the problem. Describe the nature of the problem accurately.

9.7.2 If appropriate, notify the Unit Shift Supervisors of the affected system and component and the nature of the problem.

9.7.3 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.7.4 Maintain subsequent follow-up actions to problem resolution.

9.7.5 Complete any required documentation associated with the problem and submit accordingly.

9.8 When notified of component or system malfunction regarding the PVNGS Emergency Response Organization Group Pocket Pager System (primary notification), perform the following action(s):

9.8.1 Notify the appropriate PVNGS discipline of the problem. Describe the nature of the problem accurately.

9.8.2 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.8.3 Maintain subsequent follow-up actions to problem resolution.

9.8.4 Complete any required documentation associated with the problem and submit accordingly.

9.9 When notified of component or system malfunction regarding the PVNGS Emergency Voice Response System Autodialer (backup notification), perform the following action(s):

9.9.1 Notify the appropriate PVNGS discipline of the problem. Describe the nature of the problem accurately.

9.9.2 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.9.3 Maintain subsequent follow-up actions to problem resolution.

9.9.4 Complete any required documentation associated with the problem and submit accordingly.

9.10 When notified of component or system malfunction regarding the Offsite Siren Warning System, perform the following action(s):

NOTE

The following organizations have the ability to detect and notify PVNGS Emergency Planning of Offsite Siren Warning System malfunction: Maricopa County Department of Emergency Management (MCDEM), Maricopa County Sheriff's Office (MCSO), Arizona Department of Public Safety (DPS), APS Microwave Center, and APS Communications Systems.

Onshift Operations Management

9.10.1 Notify PVNGS Emergency Planning of the problem. Describe the nature of the problem accurately.

9.10.1.1 IF 40% (16 or more) sirens are out of service for greater than 1 hour, **THEN notify the USNRC within one hour.**

PVNGS Emergency Planning

9.10.2 Notify APS Communications Systems of the problem. Describe the nature of the problem accurately.

9.10.3 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

9.10.4 Contact an organization other than the one reporting the problem to determine the scope of the problem, i.e., system-wide or isolated.

9.10.5 If the problem is determined to be isolated in nature, contact the Maricopa County Department of Emergency Management and request a possible change to System Master Control capabilities.

9.10.6 If the problem is determined to be system-wide (i.e., greater than 40% failure, or 16 or more sirens, out of service for greater than 1 hour), perform the following actions immediately:

9.10.6.1 Inform Nuclear Regulatory Affairs (during normal working hours) or the Unit 1 Shift Supervisor (off-hours) of the system failure and request a notification be initiated to the USNRC within 1 hour of siren system failure. Describe the nature of the problem accurately.

9.10.6.2 Notify APS Communications Systems of system outage status.

9.10.6.3 Notify Maricopa County Department of Emergency Management and request a notification be initiated to the Maricopa County Sheriff's Office regarding system outage status and the potential for MCSO to assume notification functions.

9.10.6.4 Inform the APS Switchboard of system outage status.

9.10.6.5 Maintain subsequent follow-up actions to problem resolution.

9.10.7 When the malfunction has been corrected, contact the Maricopa County Department of Emergency Management and request a test of the system be initiated.

9.10.8 If the problem had been determined to be system-wide and testing of the Offsite Siren Warning System has been completed satisfactorily, notify Nuclear Regulatory Affairs (during normal working hours) or the Unit 1 Shift Supervisor (off-hours) of system test results.

9.10.9 Notify the Program Leader - Emergency Planning (or designee) of the Offsite Siren Warning System test results.

9.10.10 Complete any required documentation associated with the problem and submit accordingly.

9.11 Inadvertent Siren System Activation. When notified of an inadvertent siren system activation, perform the following action(s):

9.11.1 APS Switchboard Operator Actions

9.11.1.1 When notified of an inadvertent siren activation, ask the caller to hold.

9.11.1.2 Notify PVNGS Security (82-6471 or 82-6473) and verify that no actual emergency exists.

9.11.1.3 If no PVNGS emergency exists, obtain and complete Form EP-0750, Inadvertent Siren Activation Notice (see Appendix A - Forms), acquiring as much information as possible.

9.11.1.4 If the current time is not within the hours of M-F 0700-1530 (i.e., off-work hours), perform the following actions:

9.11.1.4.1 Contact PVNGS Electrical Maintenance (Duty Pager 1810) and provide the information from Form EP-0750, Inadvertent Siren Activation Notice (see Appendix A - Forms).

9.11.1.4.2 Record the name of the Electrical Maintenance contact and the time of notification to Electrical Maintenance on Form EP-0750, Inadvertent Siren Activation Notice (see Appendix A - Forms).

9.11.1.5 If the current time is within the hours of M-F 0700-1530 (i.e., normal work hours), perform the following actions:

9.11.1.5.1 Contact APS Communications Systems (82-7112) (duty pager 1924) and provide the information from Form EP-0750, Inadvertent Siren Activation Notice (see Appendix A - Forms).

9.11.1.5.2 Record the name of the APS Communications Systems contact and the time of notification to APS Communications Systems on Form EP-0750, Inadvertent Siren Activation Notice (see Appendix A - Forms).

9.11.1.6 Inform the PVNGS Unit 1 Control Room Shift Supervisor (82-1206) of the situation.

9.11.1.7 Forward the completed Form EP-0750, Inadvertent Siren Activation Notice (see Appendix A - Forms), to PVNGS Emergency Planning, Mail Station 6050.

9.11.2 Emergency Planning Actions

9.11.2.1 Ensure that APS Switchboard personnel have accurately documented the information.

9.11.2.2 Contact APS Communications Systems / PVNGS Electrical Maintenance and ensure that the associated problem is dispositioned accordingly.

9.11.2.3 Notify the Program Leader - Emergency Planning (or designee) of the affected system and component and the nature of the problem.

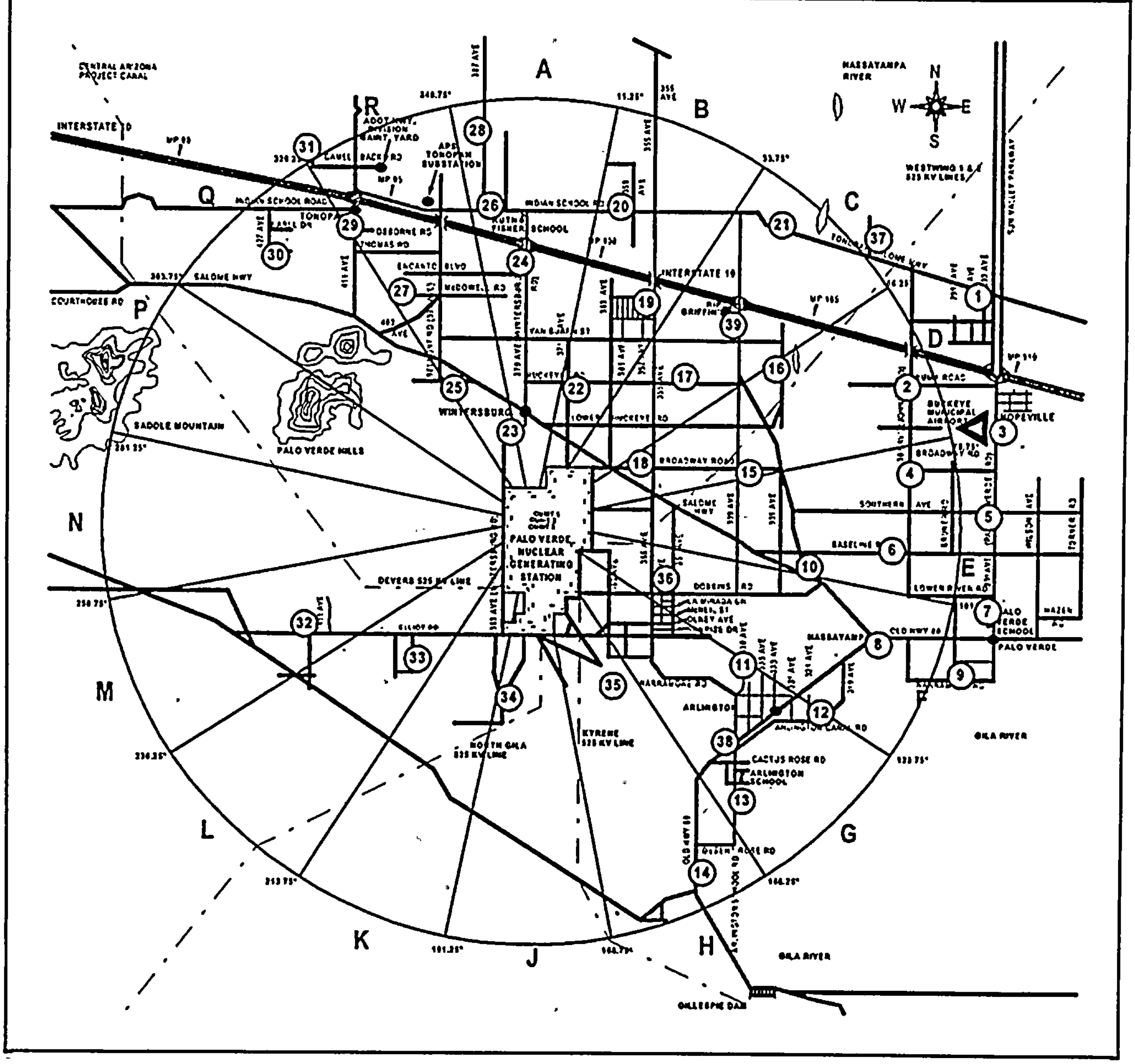
9.11.2.4 Maintain subsequent follow-up actions to problem resolution.

9.11.2.5 Complete any required documentation associated with the problem and submit accordingly.

9.11.3 Siren Deactivation Process

9.11.3.1 Verify the siren location using the following map.

PALO VERDE NUCLEAR GENERATING STATION
10-MILE EMERGENCY PLANNING ZONE



9.11.3.2 Direct a department employee to obtain the following tools (PVNGS Electrical Maintenance personnel should obtain the Siren Shutoff Box):

- 3/8" blade screwdriver
- 7/16" nut driver
- Crowbar
- Flashlight with extra batteries
- Earplugs
- Siren #21 cabinet and fence key
- Copy of this document

NOTE

Use of a 4-wheel drive vehicle requires notification to PVNGS Security (82-6471 or 82-6473) prior to deployment.

9.11.3.3 Provide a briefing to the department employee regarding the following items:

- Siren location (Section 4 / APS Switchboard Operator report)
- Siren type (Section 5 - Solar / Electronic or Mechanical)
- Securing the siren regardless of current status
- Completing Form EP-0751, Siren Deactivation (see Appendix A - Forms)

9.11.3.4 Proceed to the siren location, secure the siren per Section 9.11.4 or 9.11.5 of this document, and report when completed.

9.11.3.5 Complete Form EP-0751, Siren Deactivation (see Appendix A - Forms), and return.

9.11.3.6 Contact the Maricopa County Sheriff's Office Shift Supervisor (602-256-1011) and report that an inadvertent siren activation had been reported and that it has been checked, deactivated, and is currently silent.

9.11.3.7 Notify PVNGS Emergency Planning (82-6178) of the situation on their next scheduled work day and forward completed Form EP-0751, Siren Deactivation (see Appendix A - Forms), to PVNGS Emergency Planning, Mail Station 6050.

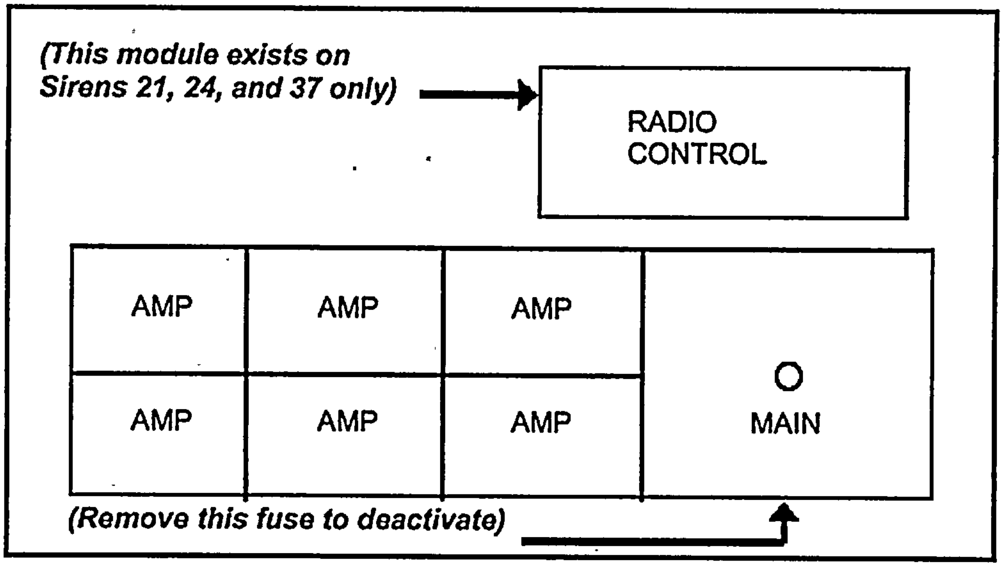
9.11.4 Siren Deactivation for Solar / Electronic Sirens 21, 24, 37, 38, and 39 only

9.11.4.1 Open the appropriate cabinet door:

- Siren 21: East door
- Siren 24: East door
- Siren 37: North door
- Siren 38: North door - top cabinet
- Siren 39: North door - top cabinet

9.11.4.2 Remove the fuse labeled "MAIN" and place it in the bottom of cabinet.

9.11.4.3 Close and lock the cabinet door.



9.11.5 Siren deactivation for Mechanical Sirens only

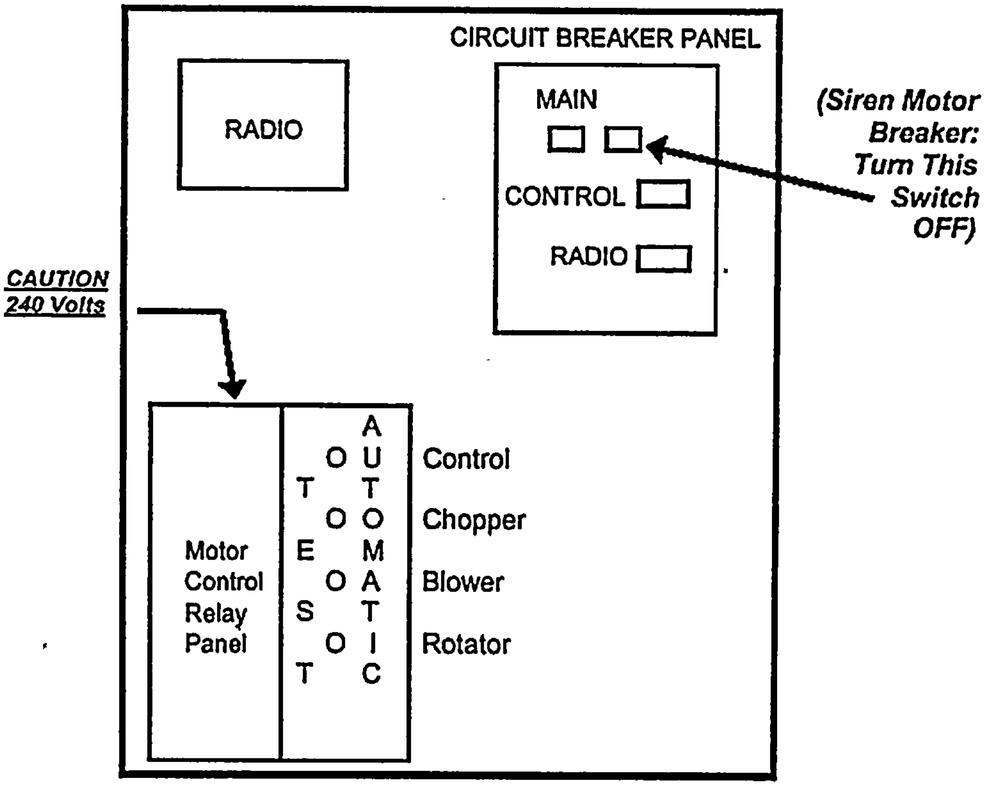
9.11.5.1 Open the main cabinet door.

9.11.5.2 Open the circuit breaker panel door.

9.11.5.3 Turn off the motor breaker (top right-hand double switch).

9.11.5.4 Close the circuit breaker panel door.

9.11.5.5 Close and lock the main cabinet door.



10.0 Emergency Planning Training Program Description

10.1 Scope

This document outlines only the minimum training and qualification requirements necessary to qualify and maintain proficiency in duties associated with the PVNGS Emergency Preparedness Program.

10.2 Responsibilities

10.2.1 The Program Leader - Emergency Planning (or designee) shall be responsible for coordination of the following activities:

- Provision for technical review of the PVNGS Training Department's Emergency Preparedness lesson plan revisions when requested.
- Training for table-top, facility, radiological, medical, and major training scenarios, as required.
- Training briefings for offsite organizations who render assistance to PVNGS, as required.
- Provision for annual information dissemination regarding the onsite Unit Evacuation System, its various alerting sounds, actions to be taken when activated, and the telephone options for listening to recorded siren sounds.
- Assurance that PVNGS Program Leaders maintain their personnel qualified, where applicable, in Emergency Preparedness Training requirements on an annual basis.

10.2.2 Individual employees shall be responsible for the following activities:

- Maintaining an active Security ACAD by ERO personnel requiring access to the TSC or EOF to ensure participation in the Fitness-for-Duty Program.
- Attendance of Emergency Preparedness Training when scheduled.

10.3 Limitations

10.3.1 Emergency Response Personnel current in their ERO qualifications as of December 30, 1998 are considered to have completed initial ERO training. This consideration does not apply to specific discipline training. New personnel, or existing ERO members assigned to fill an ERO position in which they have not previously qualified, shall complete the Initial Training requirements for that position as specified in this procedure. All ERO personnel shall complete Continuing Training requirements as specified in this procedure.

10.3.2 Emergency Preparedness Training is required once per calendar year. An effort should be made to complete the training at approximately the same time each year to avoid inconsistencies associated with the interval.

10.3.3 Individuals who fail to complete their annual Emergency Preparedness Training requirements by the last working day of the calendar year shall have their emergency response qualifications suspended until completion of required training.

10.3.4 Assignment to discipline specific ERO positions will be granted to personnel only after fully qualifying per the ERO position qualification card and per the appropriate discipline Training Program Description.

10.3.5 Individuals who fail to complete their discipline related (re)qualifications which serve as prerequisites for qualifications of Emergency Response Organization duties shall have their emergency response qualifications suspended until completion of required discipline specific training.

10.3.6 Onsite Emergency Preparedness Training should be developed using a process similar to that described within the Nuclear Training Department Administrative Procedures or other approved training program.

10.3.7 Lesson plans and examinations are not required for offsite support organization training. In this case, briefing forms and outlines may establish acceptable means of documentation. The PVNGS Emergency Planning Program Leader shall maintain records associated with offsite support organization training.

10.4 Basic training

10.4.1 Personnel requiring access to the Owner Controlled Area are provided annual information via newsletters, brochures, etc. regarding actions to take in the event of an emergency at the plant.

10.5 Emergency Response Organization Training

10.5.1 PVNGS personnel assigned duties in the Emergency Response Organization shall receive initial training and annual retraining specific to their emergency assignment. (See Training Requirements in Section 3 of this document for details.)

10.5.2 The following criteria shall apply to training course failure by a student:

- Student qualification on tasks assigned to or associated with a course will be voided upon failure of the course examination.
- Remedial examinations shall be comparable to, but not the same as, the original examination failed by the student.
- A score of 80% or greater on the course examination is required for satisfactory completion of the course requirements.
- Failure of a course (i.e., examination score < 80%) will require the student to wait at least one working day prior to retaking the course (remediation).
- Failure of a remedial evaluation will require a review of the individual's performance history by the Section Leader of Technical Training and the individual's management for determination of corrective actions.

10.5.3 As necessary, additional (re)training of individuals should be conducted when significant changes to the PVNGS Emergency Plan and/or implementing procedures occur as determined by the Emergency Planning Program Leader and the Nuclear Training Department Leader.

10.5.4 To assist personnel in the development of skills required for an emergency, drills and exercises are conducted periodically in addition to annual retraining.

10.6 Onsite Medical Staff Training

10.6.1 The PVNGS onsite medical staff, excluding administrative support personnel, shall attend training similar in content to that which is provided to Maryvale Medical Center and Good Samaritan Medical Center staff on an annual basis.

10.7 Emergency Planning Staff Training

10.7.1 Training for PVNGS Emergency Planning staff is conducted via the completion of a required reading list and/or other training and includes participation in industry sponsored emergency planning symposia and workshops.

10.8 Offsite Organization Training

10.8.1 As appropriate, briefings for the members of the following offsite support organizations shall occur on an annual basis:

- APS Corporate Public Information personnel (PI)
- Arizona Division of Emergency Management (ADEM)
- Arizona Radiation Regulatory Agency (ARRA)
- Good Samaritan Medical Center
- Maricopa County Department of Emergency Management (MCDEM)
- Maryvale Medical Center
- Others as deemed necessary

10.8.2 Briefings should be specific to the agencies' response assignment(s) and, at a minimum, should include the following:

- Basic radiation protection (excluding ARRA)
- Emergency response procedures
- Interface with the PVNGS Emergency Response Organization

10.9 Media Training

10.9.1 In conjunction with state and county government personnel, briefings shall be offered to local and regional news media personnel on an annual basis. The familiarization briefings should be conducted by PVNGS Emergency Planning and PVNGS Communications personnel and should include the following items:

- PVNGS Emergency Plan
- Basic information regarding PVNGS operation / radiation
- Locations / mechanism for release of public information in an emergency
- Familiarization tour of the Joint Emergency News Center (JENC)

10.10 Emergency Response Organization Training Requirements

10.10.1 The table below contains the minimum training requirements for each Emergency Response Organization (ERO) position. Department / Discipline training programs may require additional training for enhanced performance beyond that specified in the table. Unless specifically indicated, the Continuing / Retraining subject areas are required to be trained annually.

10.10.2 The EP Overview / Fundamentals Course should address the structure of the Emergency Response Organization, PVNGS emergency classification scheme, emergency facilities, major lines of communication, and a general overview of PVNGS emergency response. This training requirement may be met by attending discipline specific EP training, and/or satisfactorily completing the CMI (CBT) course NGE04 "Emergency Plan Overview".

10.10.3 The "Initial Training" column in the following table contains the numbers of "Job Qualification Cards" (JQC) for the specified position. Asterisked JQC numbers ("**") indicate JQCs existing within the discipline training programs. All other JQCs are available through the Emergency Preparedness Program.

10.10.4 In addition to other training requirements, any ERO position assigned to the TSC or EOF shall maintain a valid ACAD.

ERO POSITION	INITIAL TRAINING (JQC)	CONTINUING / RETRAINING
Administrative and Logistics Coordinator	NEP01-XX-017	EP Overview / Fundamentals
Administrative Support	NEP01-XX-019	EP Overview / Fundamentals
Assistant Emergency Operations Director	NEP01-XX-029	EP Emergency Coordinator or EOD specific training
Chemistry Coordinator	NEP01-XX-005	EP Overview / Fundamentals
Chemistry Technician	NCQ34-XX-001 **	EP Overview / Fundamentals
Dose Assessment Health Physicist	NRE00-XX-004 **	EP Overview / Fundamentals
Electrical Engineering	NEP01-XX-006	EP Overview / Fundamentals
Electrical Maintenance Technician	NEA99-XX-009 **	Site Access *(Re)*training
Emergency Coordinator Technical Assistant	NEP01-XX-007	EP Emergency Coordinator
Emergency Maintenance Coordinator	NEP01-XX-008	EP Overview / Fundamentals
Emergency Operations Director	NEP01-XX-028	NGE22

ERO POSITION	INITIAL TRAINING (JQC)	CONTINUING / RETRAINING
Fire Protection / Emergency Medical Technician	NPF68 **	EP *(NPL09 or equivalent)*
Government Liaison	NEP01-XX-018	EP Overview / Fundamentals
Information Coordinator	NEP01-XX-021	EP Overview / Fundamentals
Instrumentation and Control Technician	NIJ01-XX-305 **	Site Access *(Re)*training
Mechanical Engineering	NEP01-XX-009	EP Overview / Fundamentals
Mechanical Maintenance Technician	NMO01-XX-101/102 **	Site Access *(Re)*training
Onshift Emergency Coordinator	SRO + EC LOCT	LOCT
Onsite Emergency Coordinator	NEP01-XX-027	EP Emergency Coordinator
Operations Advisor	NEP01-XX-001	EP Emergency Coordinator
Operations Coordinator	NEP01-XX-010	EP Emergency Coordinator
Operations Support Center Coordinator	NEP01-XX-002	EP Overview / Fundamentals
Plant Status Technician	NEP01-XX-011	EP Overview / Fundamentals
Probabilistic Risk Assessment	NEP01-XX-012	EP Overview / Fundamentals
Rad Waste Operator	NLN10-05 **	• EP Overview / Fundamentals • STSC Communicator
Radiation Protection Monitor	NRE00-XX-005 **	• EP Overview / Fundamentals • RPM / RPC / RAC
Radiation Protection Support Technician	NRE00-XX-002 **	EP Overview / Fundamentals
Radiation Protection Technician	NRE00-XX-003 **	• EP Overview / Fundamentals • RP Emergency Teams
Radiological Assessment Communicator	NRE00-XX-002 **	EP Overview / Fundamentals
Radiological Assessment Coordinator	NRE00-XX-005 **	• EP Overview / Fundamentals • RPM / RPC / RAC
Radiological Monitoring Technician	NCQ48-XX-001 **	EP Overview / Fundamentals
Radiological Protection Coordinator	NRE00-XX-005 **	• EP Overview / Fundamentals • RPM / RPC / RAC

ERO POSITION	INITIAL TRAINING (JQC)	CONTINUING / RETRAINING
Radiological Monitoring Technician	NCQ48-XX-001 **	EP Overview / Fundamentals
Radiological Protection Coordinator	NRE00-XX-005 **	• EP Overview / Fundamentals • RPM / RPC / RAC
Reactor Analyst	NEP01-XX-013	• EP Overview / Fundamentals • Core Damage Assessment *(Biennial)*
Licensed Operator (Shift Manager, CR Supervisor, CR Operator)	Licensed Operator Initial Training (LOIT)	Licensed Operator Continuing Training (LOCT)
Repairs Coordinator	NEP01-XX-004	EP Overview / Fundamentals
Safety Analysis Engineer	NEP01-XX-014	EP Overview / Fundamentals
Satellite Technical Support Center Communicator (NLO)	NLN10-05 **	NLO Continuing Training (NLOCT)
Satellite Technical Support Center Communicator (Non-NLO)	NEP01-XX-026	EP Overview / Fundamentals
Security Coordinator	NEP01-XX-022	EP Overview / Fundamentals
Security Director	NEP01-XX-003	EP Overview / Fundamentals
(Security Force Member)	3-MSF-001-02 **	*EP Security*
Shift Technical Advisor	NOD01-XX-001 **	EP Emergency Coordinator
Systems Engineering	NEP01-XX-023	EP Overview / Fundamentals
Technical Analysis Manager	NEP01-XX-024	EP Overview / Fundamentals
Technical Engineering Manager	NEP01-XX-015	EP Overview / Fundamentals
USNRC Liaison Health Physics	NEP01-XX-025	EP Overview / Fundamentals
USNRC Liaison Operations	NEP01-XX-016	EP Overview / Fundamentals

10.11 Emergency Planning Staff Training Requirements

10.11.1 All Emergency Planning Coordinators and the Program Leader are required to read and/or discuss the documents specified in the table below as part of the job qualification and training process. Periodic reviews of these documents may occur during weekly department staff meetings or as deemed appropriate by the Program Leader. Training attendance sheets are an acceptable means to document the required reading performance.

REQUIRED READING DOCUMENTS	
10 CFR, Part 50.47 and Appendix E	FEMA-REP-14 Exercise Manual
EPIP-01 Satellite Technical Support Center Actions	FEMA-REP-15 Exercise Evaluation Methodology
EPIP-02 Operations Support Center Actions	Fixed Nuclear Facility Offsite Emergency Response Plan
EPIP-03 Technical Support Center Actions	INPO Document 85-014 EP Program Review
EPIP-04 Emergency Operations Facility Actions	INPO Document 86-032 Emergency Resources Manual
EPIP-05 Backup Emergency Operations Facility Actions	INPO Document 96-009 Maintaining Emer. Preparedness
EPIP-06 Reassembly Area Operations	INPO Document 88-019 Drill and Exercise Manual
EPIP-07 Telecommunications	Joint Public Information s *(JPIPs)*
EPIP-08 Emergency Planning Administration	NUREG-0654 / FEMA-REP-1 and Supplements
Dose Projection Technical Bases	NUREG-0737 Supplement 1
Emergency Action Level *(EAL)* Technical Bases	PVNGS Emergency Plan
EPA400-R-92-001 Protective Action Guides	USNRC EP Inspection Reports *(routed as necessary)*
	USNRC Response Technical Manual *(current version)*

Emergency Planning Coordinator Date

EP Program Leader Date

11.0 Emergency Preparedness Respiratory Guidelines

11.1 Regulatory Guidance

11.1.1 UFSAR

- The PVNGS UFSAR requires SCBAs for six personnel in the Control Room, and indicates that personnel should be capable of donning that equipment in 2 minutes or less.

11.1.2 NUREGS

- NUREG-0654 mandates that respiratory protective equipment be available in the various ERO response facilities. The inference is clear that the ERO Staff will be qualified to utilize this equipment, although specific guidance is not given as to which disciplines of the ERO Staff and the specific numbers of each are to be respiratory qualified.

11.1.3 NRC

- NRC Inspection modules include review of the respiratory equipment stocked for emergency use in emergency kits. NRC expectations when auditing biennial emergency Exercises are that repair teams will don respiratory equipment when (simulated) conditions require.

11.1.4 10CFR

- 10CFR20.1702, Use of Other Controls, lists ways of limiting intakes of radioactive material.
- 10CFR20.1703, Use of Individual Respiratory Protection Equipment, requires the licensee to (a)(4) issue a written policy statement on respirator usage covering (ii) the routine, nonroutine and emergency use of respirators.
- 10CFR50.47(b)(11), Emergency Plans, establishes means for controlling radiological exposures in an emergency for emergency workers. The means for controlling radiological exposures include exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Action Guides. The inference is that the licensee uses respiratory equipment to control internal radiological exposure.
- 29CFR1910.134, Respiratory Protection, is the Occupational Safety and Health Administration (OSHA) requirement for employers to control airborne contamination. When airborne contamination cannot be controlled, this section requires employers to provide respirators and to establish a respiratory protection program.

11.1.5 The above represents the current regulatory guidance. That guidance does not provide specific direction on which ERO Onshift and Onsite Staff members are to maintain respiratory equipment qualifications. Current PVNGS guidance for ERO Staff also does not provide specific numbers of personnel per discipline to maintain respiratory qualifications. This document is intended to establish the basis for such specific numbers.

11.2 Overview

11.2.1 The following are basic situations the Onshift ERO Staff may encounter that would require respiratory protective equipment.

11.2.1.1 Exposure to a non-radioactive hazardous materials atmosphere [SCBA required]

- This applies to a minimum number of Onshift personnel - primarily a core Control Room staff and the Fire Protection staff. All other Onshift personnel would withdraw from the affected areas rather than don protective equipment.

11.2.1.2 Exposure to tear gas from armed intruders [Gas Mask required]

- This applies to Security personnel only; protective equipment is available Onshift. All other Onshift personnel would withdraw from the affected areas rather than don protective equipment.

11.2.1.3 Exposure to a radioactive atmosphere [SCBA or Full Face required]

- This applies to all members of the Onshift staff. It is expected that the prudent normal response would allow the majority of the Onshift personnel to withdraw from the affected area. A selected number of personnel in the various disciplines need to maintain respiratory qualifications to respond for lifesaving or equipment saving vital to plant operation. Guidance is provided in the position by position review section as to the minimum qualified personnel per shift.

11.3 Positions Requiring Respiratory Qualifications

11.3.1 The number of ERO Staff members to maintain respiratory qualifications for response to Hazardous Materials and to Tear Gas is currently addressed in PVNGS guidance, with those numbers included here for clarity. The number of ERO Staff members required to respond in a radioactive atmosphere is not defined. The following analyses were done to develop numbers. The numbers were developed based on expected actions during the first two hours of an event. The numbers also are based on work in high dose/airborne area entries being minimized to the absolutely necessary (life saving or equipment saving) during that time.

11.3.2 Operations support conducted analyses of the Abnormal and Emergency Operation Procedures to identify the maintenance tasks required by the procedures during the first two hours of a plant transient or upset condition. The following is a list of those tasks and the responsible work group(s) to perform them:

- Mechanical Maintenance-Install portable air compressor for Instrument Air backup.
- Mechanical Maintenance-Repair Emergency Diesel Generator lube oil leaks.
- Mechanical Maintenance-Fill Emergency Diesel Generator crankcase with oil.
- Electrical Maintenance-Inspect and trouble shoot medium voltage circuit breaker if breaker trips or fails to close.
- Instrumentation & Control-Use troubleshooting job-aid to diagnose failure of annunciator section.
- Instrumentation & Control-Install temporary recorder for plant monitoring.
- Instrumentation & Control-Collect thermocouple data in event of RVLMS failure.

11.3.3 Radiation Protection Group conducted an analysis of their actions during the first two hours of a plant transient or upset condition with the following assumptions:

- All unnecessary personnel would exit transient high dose/airborne areas and new control boundaries would be set as necessary to confine those areas.
- A minimal number of entries into transient high dose/airborne areas to mitigate the situation will need to be done in the first two hours of the event - example, entries for lifesaving or for equipment repair vital to plant operations. Further entries into transient high dose/airborne areas would be done only as necessary and/or support allows.
- Supporting ERO Staff would not remain functioning within transient high dose/airborne area but would withdraw to backup facilities/areas.

11.3.4 Summation and Basis: the task force reviewing the above included all involved disciplines and the associated training departments. The review provides the following ERO position by position numbers with additional supporting information relating to position specifics. These numbers represent the minimum number of personnel to be available. "SCBA" means qualification to wear a Self Contained Breathing Apparatus; "FF" means qualification to wear a Full Face respirator; "SCBA/FF" means qualification to wear both. It is expected that in actual practice the numbers of qualified personnel will be higher.

11.4 Position Qualifications and Basis

GROUP	SCBA / FF QUALIFIED	BASIS
Control Room, STSC	All licensed personnel and STAs, and three Auxiliary Operators (one per Unit crew) maintain SCBA/FF. *	This staff might have to function in a radiological airborne or hazardous materials environment to bring the unit to a safe shutdown condition.
Chemistry	One Chemistry Technician maintains SCBA/FF. **	This staff might have to function in an extreme radiological environment to obtain reactor coolant analysis.
Radiation Monitoring	One Radiation Monitoring Technician maintains FF. **	This staff might have to function in a radiological environment to obtain correlation release point samples. This staff would not function in an extreme radiological environment or in a hazardous materials environment.
Electrical I&C Mechanical	One qualified member of each discipline maintains FF. **	This staff might have to function in a radiological environment to repair vital equipment. This staff would not function in an extreme radiological environment or in a hazardous materials environment.
Radiation Protection	Two Radiation Protection Technicians maintain SCBA/FF. **	Some of the available staff might have to function in an extreme radiological environment to support firefighting, lifesaving, equipment saving, etc. The rest of the staff would fall back with the RCA boundaries and would not require respiratory protection.
Fire Protection	All Onshift Fire Protection staff maintain SCBA. *	The available staff may have to respond in entirety to a hazardous or extreme radiological environment for lifesaving purposes. In addition, SCBAs are required for firefighting.
Security	All Onshift Security personnel designated as **Armed Responders.** *	For situations where a radioactive release or hazardous material release is ongoing, the Security Force would go into a "Fallback" mode. Posts would not be left unattended but personnel would retreat to the nearest safe location where the area can be monitored. Respiratory protection would not be required. Manning of the CAS and SAS would be maintained in the "fallback" mode as above. It is expected that one or both would be able to stay operational during a release situation without respiratory protection being required.

*** Required to be "clean shaven" while on duty.** A "clean shaven" condition exists when no facial hair can interfere with the respirator's facial seal.

**** Required to be capable of being "clean shaven" while on duty.**

Personnel who require corrective lenses while wearing a respirator or SCBA shall always have their corrective lenses readily available while on duty.

11.5 Justification by Position

11.5.1 Control Room Staff may have to remain in the affected unit to perform safe shutdown.

11.5.2 AOs may be sent out during the initial two hours of activity for search and rescue or to repair vital equipment. In addition, airborne activity in the affected unit might require respiratory protection to assist in performing the EOPs. Two qualified AOs available as a minimum are adequate to support these activities. Respiratory equipment is available in the STSC and OSC.

11.5.3 Chemistry activities would include primary sampling to verify activity levels. PASS sampling preparation might begin during the initial two hours, although the PASS procedure "Cautions" the Chemistry Leader to recommend at least a 2-hour delay after reactor trip prior to sampling under accident conditions. Airborne activity in the affected unit might mandate respiratory protection. One qualified Chemistry Tech is deemed adequate to meet these initial two-hour needs. Respiratory equipment is available in the OSC.

11.5.4 Effluent related activities would include sampling stack release points, RMS monitoring and release point calculations. Airborne activity in the affected unit might mandate respiratory protection for sampling. One qualified RM Tech is deemed adequate to meet these initial two-hour needs. Respiratory equipment is available in the OSC.

11.5.5 Radiation Protection will perform dose assessment; onsite, offsite and inplant surveys; coverage for repair, corrective action, search and rescue and fire teams; access control; personnel monitoring and dosimetry issue. Respiratory equipment is available in the OSC.

11.5.5.1 Dose assessment can be done in a low dose area under any conditions by use of backup equipment and facilities.

11.5.5.2 Onsite, offsite and inplant surveys in the first two hours are performed to define and contain areas. Teams are sent out to determine plume edges, dose boundaries, etc. Respiratory protection is not required for these surveys.

11.5.5.3 Coverage for repair, corrective action, search and rescue and fire teams may be required for a minimal amount of entries during the first two hours. Two qualified RP Techs should be available as a minimum.

11.5.5.4 Access Control, Personnel Monitoring and Dosimetry issue will all be performed in a low dose area with respiratory protection not required.

11.5.6 Some of the available Onshift Security personnel are considered to need gas masks. Security Dept. maintains that equipment immediately available to the personnel. That equipment is outside of the Emergency Planning maintained equipment specified elsewhere in this document.

11.5.7 ONSITE STAFF (after 2 hours): Respiratory equipment is required in the TSC/EOF by NUREG 0654. The expected use would be primarily by the RP Support Tech monitoring habitability. Air sampling and surveying may be done outside the facility envelope. One qualified RP Support Tech is deemed adequate for minimum operation in each facility. It is not expected that any other TSC/EOF position will require respiratory protection. Facility relocation would be utilized in the event of a facility airborne problem.

Appendix A - Forms

TABLE OF CONTENTS

1.0 Precautions and limitations

1.1 Forms in this appendix are to be considered "samples." In accordance with 01DP-0AP01, Procedure Process," the user may copy a sample form from the procedure if the copy is legible enough to use.

1.2 Forms in this appendix are available on the PVNGS Local Area Network (LAN), on drive V:, in directory \Eplan\Forms.

PV216-08NI (8-88)

2.0 Forms

2.1 Form EP-0541, Palo Verde NAN Emergency Message (sample)

FORM EP-0541 c

PVNGS EMERGENCY PLANNING

PALO VERDE NAN EMERGENCY MESSAGE FORM

① *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

② This NAN call was initiated at: ____________ *(time)*

③ This is Palo Verde Nuclear Generating Station Notification of

(circle one) UNUSUAL EVENT SITE AREA EMERGENCY
ALERT GENERAL EMERGENCY

declared in Unit ____ at ______ *(time)* on ______ *(date)*

PVNGS Emergency Status Code(s) ____________

④ The wind is from ________ *(35' elev - 15 min avg)* Degrees at ________ *(35' elev - 15 min avg)* MPH

Authenticator Code: ____________

This is ____________ *(name)* : STSC Comm Gov't Liaison *(circle one)*

at ____________ *(ERO facility)*

⑤ THERE IS *(circle one)* A Radioactive Release NO Radioactive Release

...taking place at this time due to this event

THE FOLLOWING ACTION IS RECOMMENDED: *(check one)*

- ☐ There are no Protective Actions required
- ☐ Shelter 2-mile radius
- ☐ Evacuate 2-mile radius and 5 miles in Sectors ______
- ☐ Evacuate 5-mile radius and 10 miles in Sectors ______
- ☐ Other ______

⑥ *(circle one)* THIS IS A DRILL THIS IS NOT A DRILL

Approval:

____________ *(EC / EOD Signature)*

____________ *(Date)* *(Time)*

RESPONDING AGENCY	PRIMARY LINK	ALTERNATE LINK	EMERGENCY NOTIFICATIONS		
			Date	Time	Initials
Maricopa County Sheriff's Office *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-256-1011			
AZ Department of Public Safety *(24 hrs/day)*	NAN	NAN Radio B/U or 9-602-223-2000			
AZ Radiation Regulatory Agency *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-255-4845			
AZ Division of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-244-0504			
Maricopa County Div. of Emergency Mgmt. *(0800-1700, M-F)*	NAN	NAN Radio B/U or 9-602-273-1411			
USNRC Headquarters *(STA will call)*	301-816-5100	301-951-0550			
⑦ GROUP PAGER: *(Read Message)*: "This Is / Is not a drill. This is PVNGS Unit ___ Classification ______ Please respond appropriately." *(repeat message once)*					
Group Paging System #1 *(read message above)*	EMER #1 *(pager 1611)*	Normal phone *(pager 7600-1611)*			
Group Paging System #2 *(read message above)*	EMER #2 *(pager 1677)*	Normal phone *(pager 7600-1677)*			
Group Paging System #3 *(read message above)*	EMER #3 *(pager 1633)*	Normal phone *(pager 7600-1633)*			
Dispatcher *(ECC)* *(read message above)*	Black Phone in CR	81-1080, 81-1081, or 9-602-250-1070			

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2.2 Form EP-0701, E-Kit Inventory - Ambulance (Fire Department) (sample)

FORM EP-0701 A **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:	Location: Ambulance *(Fire Department)*
VERIFICATION	
As-found Kit Seal Number:	New Kit Seal Number:
Reason for Kit Inventory: QTRLY POST-EVENT AUDIT	OTHER *(explain)*:
RECORD	

✔	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	////////////////
	4	200-mrem Dosimeter	////////////	
	2	Battery *(AA)*	////////////	////////////////
	4	Clothing Pack	////////////	////////////////
	1	Dosimeter Charger	////////////	////////////////
	4	Thermoluminescent Dosimeter *(Whole Body TLD)*	////////////	

Inventoried by: ______________ *(Performer Signature)* ________ *(Date)*

Reviewed by: ______________ *(Department Leader-EP Signature)* ________ *(Date)*

2.3 Form EP-0701, E-Kit Inventory - Ambulance (Fire Department) (sample)

FORM EP-0701 A **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: Ambulance *(Fire Department)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	/////////////	///////////////
	4	200-mrem Dosimeter	/////////////	
	2	Battery *(AA)*	/////////////	///////////////
	4	Clothing Pack	/////////////	///////////////
	1	Dosimeter Charger	/////////////	///////////////
	4	Thermoluminescent Dosimeter *(Whole Body TLD)*	/////////////	

Inventoried by: ____________ ______ Reviewed by: ____________ ______
(Performer Signature) *(Date)* *(Department Leader-EP Signature)* *(Date)*

2.4 Form EP-0702, E-Kit Inventory - Ambulance (Medical) (sample)

FORM EP-0702A **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: | Location: Ambulance *(Medical)*

VERIFICATION

As-found Kit Seal Number: | New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	/////////////	///////////////
	4	200-mrem Dosimeter	/////////////	
	2	Battery *(AA)*	/////////////	///////////////
	4	Clothing Pack	/////////////	///////////////
	1	Dosimeter Charger	/////////////	///////////////
	4	Thermoluminescent Dosimeter *(Whole Body TLD)*	/////////////	

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.5 Form EP-0703, E-Kit Inventory - EOF (sample)

FORM EP-0703c **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:	Location: EOF
VERIFICATION	
As-found Kit Seal Number:	New Kit Seal Number:
Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:	

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	/////////////	////////////////
	40	1-REM / 1.5-REM Dosimeter *(any combination)*	/////////////	
	40	200-mrem Dosimeter	/////////////	
	1	AC Air Sampler		
	6	AgX Cartridge	/////////////	
	1	Air Sample Head	/////////////	////////////////
	3	Battery *(9-Volt)*	/////////////	////////////////
	24	Battery (D)		
	2	Battery *(AA)*	/////////////	////////////////
	1	Battery Tester	/////////////	////////////////
	3	Booties *(plastic - pair)*	/////////////	////////////////
	1	Calculator	/////////////	////////////////
	1	Cellular Telephone	/////////////	////////////////
	6	Coveralls *(paper)*	/////////////	////////////////
	1	Cs^{137} Check Source		////////////////
	1	Dosimeter Charger	/////////////	////////////////
	1	EC-4 Area Monitor		
	1	EC-4 Check Source		////////////////
	1	FAG Survey Meter		
	8	Flashlights (4 hand held, 4 portable lanterns)		
	3	Gloves *(cloth - pair)*	/////////////	////////////////
	3	Gloves *(plastic - pair)*	/////////////	////////////////
	2	Marinelli Beaker	/////////////	////////////////
	6	Particulate Filter	/////////////	////////////////
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*	/////////////	
	4	*Radiation Area* Sign with Inserts	/////////////	////////////////
	1	*Radioactive Material* Labels *(rolls)*	/////////////	////////////////
	1	*Radioactive* Tape *(rolls)*	/////////////	////////////////
	10	Respirator / Iodine Canister *(each)*(Masks 1 LG 8 MED 1 SM)	/////////////	
	1	RM-20 Frisker		
	1	Screwdriver *(straight-blade)*	/////////////	////////////////
	1	Smears *(boxes)*	/////////////	////////////////
	1	Step-Off Pad	/////////////	////////////////
	40	Thermoluminescent Dosimeter *(TLD)*	/////////////	
	6	Whirlpack / Envelope *(each)*	/////////////	////////////////

Inventoried by: ____________ ______ Reviewed by: ____________ ______
(Performer Signature) *(Date)* *(Department Leader-EP Signature)* *(Date)*

2.6 Form EP-0704, E-Kit Inventory - Offsite Decon (Buckeye Airport) (sample)

FORM EP-0704B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:	Location: Offsite Decon *(Buckeye Airport)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	//////////////////
	50	200-mrem Dosimeter	/////////////	
	25	Bag *(plastic - large)*	/////////////	////////////////
	9	Battery *(D)*	/////////////	////////////////
	1	Battery Tester	/////////////	////////////////
	50	Booties *(plastic - pair)*	/////////////	////////////////
	2	Bucket	/////////////	////////////////
	1	Bullhorn	/////////////	////////////////
	50	Coveralls *(paper)*	/////////////	////////////////
	1	Cs^{137} Check Source		////////////////
	4	Decontamination Spray *(GOSH)*	/////////////	////////////////
	2	Decontamination Spray heads	/////////////	////////////////
	1	Dosimeter Charger	/////////////	////////////////
	1	E-140N / 530 Frisker #1		
	1	E-140N / 530 Frisker #2		
	1	E-140N / 530 Frisker #3		
	1	E-140N / 530 Frisker #4		
	5	Extension Cord *(125-foot)* with 2 15-foot Thresholds	/////////////	////////////////
	1	First Aid Kit	/////////////	////////////////
	2	Flashlight	/////////////	////////////////
	2	Floodlight *(on stand)*	/////////////	////////////////
	25	Gloves *(plastic - pair)*	/////////////	////////////////
	1	Hand Lotion *(bottles)*	/////////////	////////////////
	2	Masking Tape *(rolls)*	/////////////	////////////////
	1	Masslin Cloth *(packs)*	/////////////	////////////////
	6	Pen	/////////////	////////////////
	6	*Radiation Area* Sign with Inserts	/////////////	////////////////
	50	*Radioactive* Rope *(feet)*	/////////////	////////////////
	1	*Radioactive* Tape *(rolls)*	/////////////	////////////////
	4	Razor	/////////////	////////////////
	1	Scissors	/////////////	////////////////
	2	Scrub Brush	/////////////	////////////////
	2	Shampoo *(personal-size containers)*	/////////////	////////////////
	2	Shaving Cream *(cans)*	/////////////	////////////////
	1	Smears *(boxes)*	/////////////	////////////////
	6	Soap *(bars)*	/////////////	////////////////
	6	Stanchion	/////////////	////////////////
	2	Step-Off Pad	/////////////	////////////////
	1	Swab *(cotton - packs)*	/////////////	////////////////
	2	Towel *(rolls)*	/////////////	////////////////
	10	Traffic Cone	/////////////	////////////////

Inventoried by: ____________________ *(Performer Signature)* ________ *(Date)*

Reviewed by: ____________________ *(Department Leader-EP Signature)* ________ *(Date)*

2.7 Form EP-0706, E-Kit Inventory - Offsite Hospital (Good Samaritan) (sample)

FORM EP-0706B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

NOTE: **FEMA requires a copy of this completed inventory to remain in the Emergency Kit**

Print Name: | Location: Offsite Hospital *(Good Sam)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	25	200-mrem Dosimeter	//////////////	
	25	1-REM / 1.5-REM Dosimeter *(any combination)*	//////////////	
	1	Air Sample Head	//////////////	////////////////
	2	Bag *(plastic - large)*	//////////////	////////////////
	2	Battery *(9-volt)*	//////////////	////////////////
	2	Battery *(AA)*	//////////////	////////////////
	1	Battery Tester	//////////////	////////////////
	1	Bottle *(polyethylene)*	//////////////	////////////////
	7	Clothing Pack	//////////////	////////////////
	1	Crescent Wrench *(10")*	//////////////	////////////////
	1	Cs^{137} Check Source		////////////////
	1	Decontamination Table-top	//////////////	////////////////
	1	Dosimeter Charger	//////////////	////////////////
	1	FAG Survey Meter #1		
	1	FAG Survey Meter #2		
	1	Herculite *(pre-cut set)*	//////////////	////////////////
	1	Lead Pig	//////////////	////////////////
	2	Masking Tape *(rolls)*	//////////////	////////////////
	1	Masslin Cloth *(packs)*	//////////////	////////////////
	1	Masslin Sweeper	//////////////	////////////////
	6	Particulate Filter	//////////////	////////////////
	3	*Radiation Area* Sign with Inserts	//////////////	////////////////
	1	*Radioactive Material* Labels *(rolls)*	//////////////	////////////////
	1	*Radioactive* Ribbon *(rolls)*	//////////////	////////////////
	25	*Radioactive* Rope *(feet)*	//////////////	////////////////
	1	*Radioactive* Tape *(rolls)*	//////////////	////////////////
	1	RAS Air Sample Pump		
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	1	Showerhead / Hose *(each)*	//////////////	////////////////
	1	Smears	//////////////	////////////////
	2	Step-Off Pad	//////////////	////////////////
	12	Thermoluminescent Dosimeter *(TLD - Extremity)*	//////////////	
	25	Thermoluminescent Dosimeter *(TLD - Whole Body)*	//////////////	
	1	Tube *(bottle)*	//////////////	////////////////
	6	Whirlpack / Envelope *(each)*	//////////////	////////////////

Inventoried by: ____________________ *(Performer Signature)* ________ *(Date)*

Reviewed by: ____________________ *(Department Leader-EP Signature)* ________ *(Date)*

2.8 Form EP-0707, E-Kit Inventory - Offsite Hospital (Maryvale) (sample)

FORM EP-0707 B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

NOTE: **FEMA requires a copy of this completed inventory to remain in the Emergency Kit**

Print Name:	Location: Offsite Hospital *(Maryvale)*
VERIFICATION	
As-found Kit Seal Number:	New Kit Seal Number:
Reason for Kit Inventory: QTRLY POST-EVENT AUDIT	OTHER *(explain)*:
RECORD	

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	25	200-mrem Dosimeter	////////////	
	25	1-REM / 1.5-REM Dosimeter *(any combination)*	////////////	
	1	Air Sample Head	////////////	///////////////
	2	Bag *(plastic - large)*	////////////	///////////////
	2	Battery *(9-volt)*	////////////	///////////////
	2	Battery *(AA)*	////////////	///////////////
	1	Battery Tester	////////////	///////////////
	1	Bottle *(polyethylene)*	////////////	///////////////
	7	Clothing Pack	////////////	///////////////
	1	Crescent Wrench *(10")*	////////////	///////////////
	1	Cs^{137} Check Source		///////////////
	1	Decontamination Table-top	////////////	///////////////
	1	Dosimeter Charger	////////////	///////////////
	1	FAG Survey Meter #1		
	1	FAG Survey Meter #2		
	1	Herculite *(pre-cut set)*	////////////	///////////////
	1	Lead Pig	////////////	///////////////
	2	Masking Tape *(rolls)*	////////////	///////////////
	1	Masslin Cloth *(packs)*	////////////	///////////////
	1	Masslin Sweeper	////////////	///////////////
	6	Particulate Filter	////////////	///////////////
	3	*Radiation Area* Sign with Inserts	////////////	///////////////
	1	*Radioactive Material* Labels *(rolls)*	////////////	///////////////
	1	*Radioactive* Ribbon *(rolls)*	////////////	///////////////
	25	*Radioactive* Rope *(feet)*	////////////	///////////////
	1	*Radioactive* Tape *(rolls)*	////////////	///////////////
	1	RAS Air Sample Pump		
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	1	Showerhead / Hose *(each)*	////////////	///////////////
	1	Smears	////////////	///////////////
	2	Step-Off Pad	////////////	///////////////
	12	Thermoluminescent Dosimeter *(TLD - Extremity)*	////////////	
	25	Thermoluminescent Dosimeter *(TLD - Whole Body)*	////////////	
	1	Tube *(bottle)*	////////////	///////////////
	6	Whirlpack / Envelope *(each)*	////////////	///////////////

Inventoried by: ______ *(Performer Signature)* ______ *(Date)*	Reviewed by: ______ *(Department Leader-EP Signature)* ______ *(Date)*

2.9 Form EP-0708, E-Kit Inventory - OSC (Unit 1) (sample)

FORM EP-0708 **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:	Location: OSC *(Unit 1)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	////////////	///////////////
	1	AC Air Sampler		
	6	AgX Cartridge	////////////	
	1	Air Sample Head	////////////	///////////////
	2	Battery *(9-Volt)*	////////////	///////////////
	10	Battery *(D)*	////////////	///////////////
	1	Battery Tester	////////////	///////////////
	6	Booties *(plastic - pair)*	////////////	///////////////
	1	Calculator	////////////	///////////////
	6	Coveralls *(paper)*	////////////	///////////////
	1	Cs^{137} Check Source		///////////////
	1	DC Air Sampler		
	1	Emergency Dose Authorization Package	////////////	///////////////
	1	Extension Cord	////////////	///////////////
	1	FAG Survey Meter		
	5	Flashlight	////////////	///////////////
	6	Gloves *(cloth - pair)*	////////////	///////////////
	6	Gloves *(plastic - pair)*	////////////	///////////////
	2	Marinelli Beaker	////////////	///////////////
	1	Masking Tape *(rolls)*	////////////	///////////////
	1	Masslin Cloth *(packs)*	////////////	///////////////
	1	Onsite Map	////////////	///////////////
	6	Particulate Filter	////////////	///////////////
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*	////////////	
	5	*Radiation Area* Sign with Inserts	////////////	///////////////
	1	*Radioactive Material* Labels *(rolls)*	////////////	///////////////
	25	*Radioactive* Rope *(feet)*	////////////	///////////////
	1	*Radioactive* Tape *(rolls)*	////////////	///////////////
	4	Respirator / Iodine Canister *(each)* (size medium)	////////////	
	2	Respirator Mask *(spare)* (1 LG 1 SM)	////////////	///////////////
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	1	RMS Handling Tool *(latch / gripper)*	////////////	///////////////
	1	RMS Hi-Range Skid Sample Head	////////////	///////////////
	1	Screwdriver *(straight-blade)*	////////////	///////////////
	4	Self-Contained Breathing Apparatus	////////////	///////////////
	2	Self-Contained Breathing Apparatus *(spare masks)*(1 LG 1 SM)	////////////	///////////////
	1	Smears *(boxes)*	////////////	///////////////
	2	Step-Off Pad	////////////	///////////////
	6	Whirlpack / Envelope *(each)*	////////////	///////////////

Inventoried by: ______________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ______________ *(Department Leader-EP Signature)* ______ *(Date)*

2.10 Form EP-0709, E-Kit Inventory - OSC (Unit 2) (sample)

FORM EP-0709 B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: OSC *(Unit 2)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	////////////	//////////////
	1	AC Air Sampler		
	6	AgX Cartridge	////////////	
	1	Air Sample Head	////////////	//////////////
	2	Battery *(9-Volt)*	////////////	//////////////
	10	Battery *(D)*	////////////	//////////////
	1	Battery Tester	////////////	//////////////
	6	Booties *(plastic - pair)*	////////////	//////////////
	1	Calculator	////////////	//////////////
	6	Coveralls *(paper)*	////////////	//////////////
	1	Cs^{137} Check Source		//////////////
	1	DC Air Sampler		
	1	Emergency Dose Authorization Package	////////////	//////////////
	1	Extension Cord	////////////	//////////////
	1	FAG Survey Meter		
	5	Flashlight	////////////	//////////////
	6	Gloves *(cloth - pair)*	////////////	//////////////
	6	Gloves *(plastic - pair)*	////////////	//////////////
	2	Marinelli Beaker	////////////	//////////////
	1	Masking Tape *(rolls)*	////////////	//////////////
	1	Masslin Cloth *(packs)*	////////////	//////////////
	1	Onsite Map	////////////	//////////////
	6	Particulate Filter	////////////	//////////////
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*	////////////	
	5	*Radiation Area* Sign with Inserts	////////////	//////////////
	1	*Radioactive Material* Labels *(rolls)*	////////////	//////////////
	25	*Radioactive* Rope *(feet)*	////////////	//////////////
	1	*Radioactive* Tape *(rolls)*	////////////	//////////////
	4	Respirator / Iodine Canister *(each)* (size medium)	////////////	
	2	Respirator Mask *(spare)* (1 LG 1 SM)	////////////	//////////////
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	1	RMS Handling Tool *(latch / gripper)*	////////////	//////////////
	1	RMS Hi-Range Skid Sample Head	////////////	//////////////
	1	Screwdriver *(straight-blade)*	////////////	//////////////
	4	Self-Contained Breathing Apparatus	////////////	//////////////
	2	Self-Contained Breathing Apparatus *(spare masks)*(1 LG 1 SM)	////////////	//////////////
	1	Smears *(boxes)*	////////////	//////////////
	2	Step-Off Pad	////////////	//////////////
	6	Whirlpack / Envelope *(each)*	////////////	//////////////

Inventoried by: ______________________ *(Performer Signature)* ________ *(Date)*

Reviewed by: ______________________ *(Department Leader-EP Signature)* ________ *(Date)*

2.11 Form EP-0710, E-Kit Inventory - OSC (Unit 3) (sample)

FORM EP-0710B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:	Location: OSC *(Unit 3)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	//////////////
	1	AC Air Sampler		
	6	AgX Cartridge	//////////////	
	1	Air Sample Head	//////////////	//////////////
	2	Battery *(9-Volt)*	//////////////	//////////////
	10	Battery *(D)*	//////////////	//////////////
	1	Battery Tester	//////////////	//////////////
	6	Booties *(plastic - pair)*	//////////////	//////////////
	1	Calculator	//////////////	//////////////
	6	Coveralls *(paper)*	//////////////	//////////////
	1	Cs^{137} Check Source		//////////////
	1	DC Air Sampler		
	1	Emergency Dose Authorization Package	//////////////	//////////////
	1	Extension Cord	//////////////	//////////////
	1	FAG Survey Meter		
	5	Flashlight	//////////////	//////////////
	6	Gloves *(cloth - pair)*	//////////////	//////////////
	6	Gloves *(plastic - pair)*	//////////////	//////////////
	2	Marinelli Beaker	//////////////	//////////////
	1	Masking Tape *(rolls)*	//////////////	//////////////
	1	Masslin Cloth *(packs)*	//////////////	//////////////
	1	Onsite Map	//////////////	//////////////
	6	Particulate Filter	//////////////	//////////////
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*	//////////////	
	5	*Radiation Area* Sign with Inserts	//////////////	//////////////
	1	*Radioactive Material* Labels *(rolls)*	//////////////	//////////////
	25	*Radioactive* Rope *(feet)*	//////////////	//////////////
	1	*Radioactive* Tape *(rolls)*	//////////////	//////////////
	4	Respirator / Iodine Canister *(each)* (size medium)	//////////////	
	2	Respirator Mask *(spare)* (1 LG 1 SM)	//////////////	//////////////
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	1	RMS Handling Tool *(latch / gripper)*	//////////////	//////////////
	1	RMS Hi-Range Skid Sample Head	//////////////	//////////////
	1	Screwdriver *(straight-blade)*	//////////////	//////////////
	4	Self-Contained Breathing Apparatus	//////////////	//////////////
	2	Self-Contained Breathing Apparatus *(spare masks)*(1 LG 1 SM)	//////////////	//////////////
	1	Smears *(boxes)*	//////////////	//////////////
	2	Step-Off Pad	//////////////	//////////////
	6	Whirlpack / Envelope *(each)*	//////////////	//////////////

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.12 Form EP-0711, E-Kit Inventory - RFAT Vehicle #1 (sample)

FORM EP-0711 B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: RFAT Vehicle #1

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	//////////////
	1	110-Volt AC Generator (start and run)	//////////////	//////////////
	2	200-mrem Dosimeter	//////////////	
	2	5-REM Dosimeter	//////////////	
	1	AC Air Sampler		
	6	AgX Cartridge	//////////////	
	1	Air Sample Fuse	//////////////	//////////////
	1	Air Sample Head	//////////////	//////////////
	3	Bag *(plastic - large)*	//////////////	//////////////
	4	Battery *(9-Volt)*	//////////////	//////////////
	2	Battery *(AA)*	//////////////	//////////////
	4	Battery *(D)*	//////////////	//////////////
	1	Battery Tester	//////////////	//////////////
	1	Calculator	//////////////	//////////////
	1	Clipboard	//////////////	//////////////
	1	Cs^{137} Check Source		//////////////
	1	DC Air Sampler		
	1	Dosimeter Charger	//////////////	//////////////
	6	Drinking Cup	//////////////	//////////////
	1	Drinking Water Container	//////////////	//////////////
	1	FAG Survey Meter		
	1	E-140N / 530 Frisker *(either)*		
	1	First Aid Kit	//////////////	//////////////
	1	Flashlight	//////////////	//////////////
	3	Gloves *(plastic - pair)*	//////////////	//////////////
	3	Marinelli Beaker	//////////////	//////////////
	3	Marker / Pen *(each)*	//////////////	//////////////
	1	Masking Tape *(rolls)*	//////////////	//////////////
	1	Offsite Map	//////////////	//////////////
	1	Onsite Map	//////////////	//////////////
	6	Particulate Filter	//////////////	//////////////
	1	Potassium Iodide *(bottles)*	//////////////	
	1	*Radioactive Material* Labels *(rolls)*	//////////////	//////////////
	1	Reassembly Area Key *(on key-ring)*	//////////////	//////////////
	1	*Radioactive* Tape *(rolls)*	//////////////	//////////////
	1	RO-2 Survey Meter		
	1	Smears *(boxes)*	//////////////	//////////////
	1	Stopwatch	//////////////	//////////////
	6	Whirlpack / Envelope *(each)*	//////////////	//////////////

Inventoried by: ______________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ______________ *(Department Leader-EP Signature)* ______ *(Date)*

2.13 Form EP-0712, E-Kit Inventory - RFAT Vehicle #2 (sample)

FORM EP-0712B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: RFAT Vehicle #2

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals		
	1	110-Volt AC Generator (start and run)		
	2	200-mrem Dosimeter		
	2	5-REM Dosimeter		
	1	AC Air Sampler		
	6	AgX Cartridge		
	1	Air Sample Fuse		
	1	Air Sample Head		
	3	Bag *(plastic - large)*		
	4	Battery *(9-Volt)*		
	2	Battery *(AA)*		
	4	Battery *(D)*		
	1	Battery Tester		
	1	Calculator		
	1	Clipboard		
	1	Cs^{137} Check Source		
	1	DC Air Sampler		
	1	Dosimeter Charger		
	6	Drinking Cup		
	1	Drinking Water Container		
	1	FAG Survey Meter		
	1	E-140N / 530 Frisker *(either)*		
	1	First Aid Kit		
	1	Flashlight		
	3	Gloves *(plastic - pair)*		
	3	Marinelli Beaker		
	3	Marker / Pen *(each)*		
	1	Masking Tape *(rolls)*		
	1	Offsite Map		
	1	Onsite Map		
	6	Particulate Filter		
	1	Potassium Iodide *(bottles)*		
	1	*Radioactive Material* Labels *(rolls)*		
	1	Reassembly Area Key *(on key-ring)*		
	1	*Radioactive* Tape *(rolls)*		
	1	RO-2 Survey Meter		
	1	Smears *(boxes)*		
	1	Stopwatch		
	6	Whirlpack / Envelope *(each)*		

Inventoried by: ______________ *(Performer Signature)* ______ *(Date)* Reviewed by: ______________ *(Department Leader-EP Signature)* ______ *(Date)*

2.14 Form EP-0713, E-Kit Inventory - RFAT Vehicle #3 (sample)

FORM EP-0713B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:	Location: RFAT Vehicle #3

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✔	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	//////////////
	1	110-Volt AC Generator (start and run)	//////////////	//////////////
	2	200-mrem Dosimeter	//////////////	
	2	5-REM Dosimeter	//////////////	
	1	AC Air Sampler		
	6	AgX Cartridge	//////////////	
	1	Air Sample Fuse	//////////////	//////////////
	1	Air Sample Head	//////////////	//////////////
	3	Bag *(plastic - large)*	//////////////	//////////////
	4	Battery *(9-Volt)*	//////////////	//////////////
	2	Battery *(AA)*	//////////////	//////////////
	4	Battery *(D)*	//////////////	//////////////
	1	Battery Tester	//////////////	//////////////
	1	Calculator	//////////////	//////////////
	1	Clipboard	//////////////	//////////////
	1	Cs^{137} Check Source		//////////////
	1	DC Air Sampler		
	1	Dosimeter Charger	//////////////	//////////////
	6	Drinking Cup	//////////////	//////////////
	1	Drinking Water Container	//////////////	//////////////
	1	FAG Survey Meter		
	1	E-140N / 530 Frisker *(either)*		
	1	First Aid Kit	//////////////	//////////////
	1	Flashlight	//////////////	//////////////
	3	Gloves *(plastic - pair)*	//////////////	//////////////
	3	Marinelli Beaker	//////////////	//////////////
	3	Marker / Pen *(each)*	//////////////	//////////////
	1	Masking Tape *(rolls)*	//////////////	//////////////
	1	Offsite Map	//////////////	//////////////
	1	Onsite Map	//////////////	//////////////
	6	Particulate Filter	//////////////	//////////////
	1	Potassium Iodide *(bottles)*	//////////////	
	1	*Radioactive Material* Labels *(rolls)*	//////////////	//////////////
	1	Reassembly Area Key *(on key-ring)*	//////////////	//////////////
	1	*Radioactive* Tape *(rolls)*	//////////////	//////////////
	1	RO-2 Survey Meter		
	1	Smears *(boxes)*	//////////////	//////////////
	1	Stopwatch	//////////////	//////////////
	6	Whirlpack / Envelope *(each)*	//////////////	//////////////

Inventoried by: ______ *(Performer Signature)* ______ *(Date)*	Reviewed by: ______ *(Department Leader-EP Signature)* ______ *(Date)*

2.15 Form EP-0714, E-Kit Inventory - Satellite TSC (Unit 1) (sample)

FORM EP-0714c **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:			Location: Satellite TSC *(Unit 1)*	
VERIFICATION				
As-found Kit Seal Number:			New Kit Seal Number:	
Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:				
RECORD				
✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals		
	1	10-Mile EPZ Map		
	1	AC Air Sampler		
	2	AgX Cartridge		
	1	Air Sample Head		
	2	Battery *(9-Volt)*		
	1	Battery Tester		
	1	Calculator		
	1	Cs^{137} Check Source		
	1	FAG Survey Meter		
	2	Marinelli Beaker		
	1	Onsite Map		
	2	Particulate Filter		
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*		
	10	Respirator / Iodine Canister *(each)* (8 MED 1LG 1SM)		
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	8	Self-Contained Breathing Apparatus (8 MED 6 LG 6 SM)		
	34	Self-Contained Breathing Apparatus *(bottles - spare)*		
	1	Smears *(boxes)*		
	2	Whirlpack / Envelope *(each)*		

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.16 Form EP-0715, E-Kit Inventory - Satellite TSC (Unit 2) (sample)

FORM EP-0715c **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: | Location: Satellite TSC *(Unit 2)*

VERIFICATION

As-found Kit Seal Number: | New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals		
	1	10-Mile EPZ Map		
	1	AC Air Sampler		
	2	AgX Cartridge		
	1	Air Sample Head		
	2	Battery *(9-Volt)*		
	1	Battery Tester		
	1	Calculator		
	1	Cs^{137} Check Source		
	1	FAG Survey Meter		
	2	Marinelli Beaker		
	1	Onsite Map		
	2	Particulate Filter		
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*		
	10	Respirator / Iodine Canister *(each)* (8 MED 1 LG 1 SM)		
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	8	Self-Contained Breathing Apparatus (8 MED 6 LG 6 SM)		
	34	Self-Contained Breathing Apparatus *(bottles - spare)*		
	1	Smears *(boxes)*		
	2	Whirlpack / Envelope *(each)*		

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.17 Form EP-0716, E-Kit Inventory - Satellite TSC (Unit 3) (sample)

FORM EP-0716c **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: Satellite TSC *(Unit 3)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	/////////////	/////////////////
	1	10-Mile EPZ Map	/////////////	/////////////////
	1	AC Air Sampler		
	2	AgX Cartridge	/////////////	
	1	Air Sample Head	/////////////	/////////////////
	2	Battery *(9-Volt)*	/////////////	/////////////////
	1	Battery Tester	/////////////	/////////////////
	1	Calculator	/////////////	/////////////////
	1	Cs^{137} Check Source		/////////////////
	1	FAG Survey Meter		
	2	Marinelli Beaker	/////////////	/////////////////
	1	Onsite Map	/////////////	/////////////////
	2	Particulate Filter	/////////////	/////////////////
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*	/////////////	
	10	Respirator / Iodine Canister *(each)* (8 MED 1 LG 1 SM)	/////////////	
	1	RM-20 Frisker #1		
	1	RM-20 Frisker #2		
	8	Self-Contained Breathing Apparatus (8 MED 6 LG 6 SM)	/////////////	/////////////////
	34	Self-Contained Breathing Apparatus *(bottles - spare)*	/////////////	/////////////////
	1	Smears *(boxes)*	/////////////	/////////////////
	2	Whirlpack / Envelope *(each)*	/////////////	/////////////////

Inventoried by: ______________ ________ Reviewed by: ______________ ________

(Performer Signature) *(Date)* *(Department Leader-EP Signature)* *(Date)*

2.18 Form EP-0717, E-Kit Inventory - Satellite TSC (Simulator-A) (sample)

FORM EP-0717 B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: Satellite TSC *(Simulator-A)*

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	////////////	///////////////
	1	10-Mile EPZ Map	////////////	///////////////
	1	AC Air Sampler	////////////	///////////////
	2	AgX Cartridge	////////////	///////////////
	1	Air Sample Head	////////////	///////////////
	1	Calculator	////////////	///////////////
	1	Cs[137] Check Source		///////////////
	1	FAG Survey Meter	////////////	///////////////
	2	Marinelli Beaker	////////////	///////////////
	1	Onsite Map	////////////	///////////////
	2	Particulate Filter	////////////	///////////////
	1	PIC-6 Survey Meter	////////////	///////////////
	1	RM-20 Frisker #1	////////////	///////////////
	1	RM-20 Frisker #2	////////////	///////////////
	1	Smears *(boxes)*	////////////	///////////////
	2	Whirlpack / Envelope *(each)*	////////////	///////////////

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)* Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

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2.19 Form EP-0718, E-Kit Inventory - Site Medical Center (sample)

FORM EP-0718 A **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: Site Medical Center

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	/////////////	/////////////
	10	200-mrem Dosimeter	/////////////	
	1	AC Air Sampler		
	1	Air Sample Head	/////////////	/////////////
	2	Bag *(plastic)*	/////////////	/////////////
	1	Battery *(9-Volt)*	/////////////	/////////////
	2	Battery *(AA)*	/////////////	/////////////
	1	Battery Tester	/////////////	/////////////
	1	Bottle *(polyethylene)*	/////////////	/////////////
	10	Clothing Pack	/////////////	/////////////
	1	Cs^{137} Check Source		/////////////
	1	Decontamination Table-top	/////////////	/////////////
	1	Dosimeter Charger	/////////////	/////////////
	1	FAG Survey Meter		
	1	Herculite *(pre-cut set)*	/////////////	/////////////
	2	Masking Tape *(rolls)*	/////////////	/////////////
	1	Masslin Cloth *(packs)*	/////////////	/////////////
	6	Particulate Filter	/////////////	/////////////
	3	*Radiation Area* Sign with Inserts	/////////////	/////////////
	25	*Radioactive* Rope *(feet)*	/////////////	/////////////
	1	*Radioactive* Tape *(rolls)*	/////////////	/////////////
	1	Smears *(boxes)*	/////////////	/////////////
	2	Step-Off Pad	/////////////	/////////////
	13	Thermoluminescent Dosimeter *(TLD - Extremity)*	/////////////	
	10	Thermoluminescent Dosimeter *(TLD - Whole Body)*	/////////////	
	1	Tube *(bottle)*	/////////////	/////////////
	6	Whirlpack / Envelope *(each)*	/////////////	/////////////

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.20 Form EP-0719, E-Kit Inventory - Soil Sampling (sample)

FORM EP-0719A **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name:			Location: Soil Sampling	
VERIFICATION				
As-found Kit Seal Number:			New Kit Seal Number:	
Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:				
RECORD				
✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	//////////////
	2	Bag *(plastic ZipLock - 9" x 12")*	//////////////	//////////////
	2	Bag *(plastic ZipLock - 12" x 18")*	//////////////	//////////////
	2	Booties *(plastic - pair)*	//////////////	//////////////
	2	Coveralls *(paper)*	//////////////	//////////////
	1	Environmental Sampling Guidance with Forms *(set)*	//////////////	//////////////
	2	Gloves *(cotton - pair)*	//////////////	//////////////
	2	Gloves *(rubber - pair)*	//////////////	//////////////
	1	Hammer	//////////////	//////////////
	1	Marker	//////////////	//////////////
	1	Masslin Cloth *(packs)*	//////////////	//////////////
	1	Pruning Shears	//////////////	//////////////
	6	*Radiological Sample* Labels	//////////////	//////////////
	1	Sampling Scoop	//////////////	//////////////
	2	Shoecovers *(plastic - pair)*	//////////////	//////////////
	3	Survey Stake	//////////////	//////////////
	1	Vinyl Tape *(rolls)*	//////////////	//////////////

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.21 Form EP-0720, E-Kit Inventory - TSC (sample)

FORM EP-0720B **PVNGS EMERGENCY PLANNING**

EMERGENCY KIT INVENTORY

Print Name: Location: TSC

VERIFICATION

As-found Kit Seal Number: New Kit Seal Number:

Reason for Kit Inventory: QTRLY POST-EVENT AUDIT OTHER *(explain)*:

RECORD

✓	Quantity	Item	Serial Number	Cal Due-Exp Date
	(per list)	ERO Position Manuals	//////////////	//////////////
	20	1-REM / 1.5-REM Dosimeter *(any combination)*	//////////////	
	20	200-mrem Dosimeter	//////////////	
	1	AC Air Sampler		
	6	AgX Cartridge	//////////////	
	1	Air Sample Head	//////////////	//////////////
	3	Battery *(9-Volt)*	//////////////	//////////////
	2	Battery *(AA)*	//////////////	//////////////
	1	Battery Tester	//////////////	//////////////
	3	Booties *(plastic - pair)*	//////////////	//////////////
	1	Calculator	//////////////	//////////////
	1	Cellular Telephone	//////////////	//////////////
	6	Coveralls *(paper)*	//////////////	//////////////
	1	Cs^{137} Check Source		//////////////
	1	Dosimeter Charger	//////////////	//////////////
	1	EC-4 Area Monitor		
	1	EC-4 Check Source		//////////////
	1	FAG Survey Meter		
	3	Gloves *(cloth - pair)*	//////////////	//////////////
	3	Gloves *(plastic - pair)*	//////////////	//////////////
	2	Marinelli Beaker	//////////////	//////////////
	6	Particulate Filter	//////////////	//////////////
	1	PIC-6 Survey Meter		
	10	Potassium Iodide *(bottles)*	//////////////	
	4	*Radiation Area* Sign with Inserts	//////////////	//////////////
	1	*Radioactive Material* Labels *(rolls)*	//////////////	//////////////
	1	*Radioactive* Tape *(rolls)*	//////////////	//////////////
	10	Respirator / Iodine Canister *(each)* (1 LG 8 MED 1 SM)	//////////////	
	1	RM-20 Frisker		
	1	Screwdriver *(straight-blade)*	//////////////	//////////////
	1	Smears *(boxes)*	//////////////	//////////////
	1	Step-Off Pad	//////////////	//////////////
	6	Whirlpack / Envelope *(each)*	//////////////	//////////////

Inventoried by: ____________ *(Performer Signature)* ______ *(Date)*

Reviewed by: ____________ *(Department Leader-EP Signature)* ______ *(Date)*

2.22 Form EP-0740, NAN Communications Test (sample)

FORM EP-0740A **PVNGS EMERGENCY PLANNING**

NAN COMMUNICATIONS TEST

DATE:	TIME:	UNIT:

Location	*NAN Primary Circuit Test* *SAT / UNSAT*	*NAN Radio Backup Test* *SAT / UNSAT*	*Comments*
Unit STSC			
MCSO			
DPS			
ARRA			
ADEM			
MCDEM			

NOTE: Report telecommunications equipment malfunctions to Communications Systems at 83-6000 and contact Emergency Planning on their next scheduled work day

GENERAL COMMENTS

NOTE: Forward this completed form to Emergency Planning - Mail Station 6050

Performed by: ______________________ Date: __________
(Signature)

Print Name: ______________________

Approved by: ______________________ Date: __________
(Department Leader - Emergency Planning Signature)

2.23 Form EP-0752, Offsite Siren Activation Planning (sample)

FORM EP-0752B **PVNGS EMERGENCY PLANNING**

OFFSITE SIREN ACTIVATION PLANNING

Scheduled Test Date:

TIME	ACTION	COMPLETE
- 2 Months	Contact Federal Emergency Management Agency *(FEMA)*	
	Update poster and transmit to Graphics	
- 1 Month	Notify Arizona Division of Emergency Management *(ADEM)*	
	Notify Maricopa County Division of Emergency Management *(MCDEM)*	
	Notify Arizona Department of Public Safety *(DPS)*	
	Notify Maricopa County Sheriff's Office *(MCSO)*	
	Notify PVNGS Strategic Communications	
	Notify APS Media Relations	
	Notify APS Public Affairs	
	Notify APS Telecommunications	
	Notify APS Communications Systems	
	Notify School Principals	
	Schedule the assembly location	
- 3 Weeks	Draft resident mailing letter	
	Transmit mailing letter to Reproduction and mail to EPZ residents per List #103	
- 2 Weeks	Schedule lunches / drinks	
- 1 Week	Prepare packages of maps, forms, and ear plugs	
	Reserve vehicles for Team Leaders	
	Provide guidance to MCSO for calls from the public	
	Provide guidance to PVNGS Strategic Communications for calls from the public	
	Provide guidance to APS Switchboard Operator for calls from the public	
	Draft letter to PVNGS employees	
	Ensure transmission of letters to local Mayors	
	Ensure transmission of letters to School Principals	
	Ensure transmission of letters to PVNGS employees	
	Ensure transmission of letters to EPZ residents	
	Situate posters within 10-mile EPZ	
	Situate onsite notices	
Test Day	Transmit packages to assembly location	
	Situate signs to direct visitors to location	
	Collect Forms EP-0753, Offsite Siren Activation Verification	
Post-Test	Prepare letter of appreciation	
	Remove posters within 10-mile EPZ	
	Prepare Siren Report for Arizona Division of Emergency Management	

2.24 Form EP-0750, Inadvertent Siren Activation Notice (sample)

FORM EP-0750c **PVNGS EMERGENCY PLANNING**

INADVERTENT SIREN ACTIVATION NOTICE

DATE Notification Received:	TIME Notification Received:
GENERAL INFORMATION	
Name of Individual Calling:	
Telephone Number of Individual:	
Siren Location and/or Siren Pole Number:	
Time Siren Was First Heard:	
Is Siren Currently Sounding?: ☐ YES ☐ NO	
PVNGS EMERGENCY PLANNING DEPARTMENT CONTACT INFORMATION	
Time Reported to PVNGS Emergency Planning Department:	
Name of Individual Contacted:	
Telephone Number of Individual Contacted:	
APS CUSTOMER SOLUTIONS CENTER INFORMATION	
Customer Service Associate Name:	______________________ *(please print)*
Customer Service Associate Signature:	______________________ ________ *(date)*
COMMENTS	
NOTE: Forward this completed form to PVNGS Emergency Planning, Mail Station 6050	

2.25 Form EP-0753, Offsite Siren Activation Verification (sample)

FORM EP-0753A **PVNGS EMERGENCY PLANNING**

OFFSITE SIREN ACTIVATION VERIFICATION

Name:	Date:	Siren Pole Number:	
Address:	City:	State:	ZIP:

CONDUCTING THE SIREN TEST

Upon arrival at the desired location:

1) Walk over to the siren pole and locate the Siren Pole Number.
2) Write the Siren Pole Number in the blank toward the top of this form.
3) Position yourself 100-200 feet from the siren pole.
4) Transmit the following message over the radio to the Communications Van:
   "This is Siren Number ______ posted, over." *(Net Control will confirm receipt of your message.)*
5) Wait for siren to sound. *(Complete the information below as required.)*
6) Immediately following the test, Net Control will ask if there were any malfunctions.
   Report *only* if your siren did not sound or did not function correctly.
7) Wait for the second test.
8) When the second test is complete, wait for your Team Leader to arrive.
9) When your Team Leader has arrived, proceed to the assembly location.

SIREN TEST INFORMATION

Siren Test #	Time Siren Started	Time Siren Stopped	Wavering Tone?	Steady Tone?
1			*YES* *NO*	*YES* *NO*
2			*YES* *NO*	*YES* *NO*

Did the horn rotate? *YES* *NO* Did the siren turn OFF? *YES* *NO*

A siren should start up gradually to full tone and coast down to the end of the test.

Was there anything unusual about the siren's operation? *YES* *NO*

If *YES*, describe: ______________________________

____

VERIFICATION

Observer: ______________________ *(signature)* __________ *(date)*

Leader / Coordinator: ______________________ *(signature)* __________ *(date)*

2.26 Form EP-0760, 10 CFR 50.54 (Q) Screening (sample)

FORM EP-0760A PVNGS EMERGENCY PLANNING

10 CFR 50.54(Q) SCREENING

Procedure / Document Number:	Procedure / Document Revision:

DOCUMENT INFORMATION

Document Title:

Description of Proposed Revision: ______________________________

ASSESSMENT OF ACCEPTABILITY

Is the proposed revision a revision to the PVNGS Emergency Plan? ☐ YES ☐ NO

Does the proposed revision require a revision to the PVNGS Emergency Plan? ☐ YES ☐ NO

◆◆ If the answer to either question is YES, a 10 CFR 50.54(Q) Evaluation must be performed ◆◆

TRAINING REQUIREMENT REVIEW

☐ A copy of this revision has been conveyed to Training Change System *(TCS)* personnel

COMMENTS

AFFIRMATION

Performed by: ______________ *(print)* ______________ *(signature)* ________ *(date)*

Reviewed by: ______________ *(print)* ★ ______________ *(signature)* ________ *(date)*

★ Indicates review of this document only

2.27 Form EP-0761, 10 CFR 50.54 (Q) Evaluation (sample)

FORM EP-0761 A **PVNGS EMERGENCY PLANNING**

10 CFR 50.54(Q) EVALUATION

Procedure / Document Number:	Procedure / Document Revision:

DOCUMENT INFORMATION

Document Title:

Document Section*(s)* affected by proposed change*(s)*:

EFFECT OF PROPOSED CHANGE(S)

10 CFR 50.47(b) Planning Standard*(s)* affected: ______

Commitment*(s)* affected: ______

EFFECTIVENESS REVIEW

Written justification is required for each NO answer. All documentation supporting rationale or justification for each NO answer must be attached to this document.

1) Does this change delete or contradict any regulatory requirement? ☐ YES ☐ NO

2) Does this change decrease the effectiveness of the PVNGS Emergency Plan resulting in the loss of reasonable assurance that adequate protection can and will be taken in the event of a radiological emergency as required by 10 CFR 50.47(a)? ☐ YES ☐ NO

3) Does this change result in the loss of ability to meet any of the standards or applicable requirements described in 10 CFR 50.47(b) and (d) or any USNRC approved alternatives to those standards and requirements? ☐ YES ☐ NO

If the answer to any question is YES or rationale does not support justification for any question answered NO, then approval is required from the USNRC Regional Office prior to implementation of the proposed change(s).

AFFIRMATION

Performed by: ______ *(print)* ______ *(signature)* ______ *(date)*

Approved by: ______ *(print)* ______ ★ *(signature)* ______ *(date)*

★ Department Leader - PVNGS Emergency Planning *(signature indicates review of this document and all applicable attachments)*

2.28 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 1 of 10 (sample)

FORM EP-0770 **PVNGS EMERGENCY PLANNING**

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 1 of 10)

(COPY TYPE)	This form contains the major actions necessary to adequately plan and implement an annual full-scale drill and exercise development cycle. If possible, the form should be completed in the approximate sequence as listed. The values listed in the DAYS Column are based on the day of the evaluated exercise. The full-scale drill is annotated as - 35 days, which correlates to one training cycle ahead of the evaluated exercise. The two DATE Columns should be completed by entering the date in each column for the specified action achieved. Critical actions are bulleted and appear bolded. Department management should be notified if any deviations from the expected timeline for these critical actions arise.

FSD Number / Date: ***EXR Number / Date:***

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
1	- 210			Establish date of Full-Scale Drill / Exercise (record on table headers)
2	- 210			Reserve Simulator-A for Full-Scale Drill / Exercise date & time period
3	- 208			Verify FEMA Protective Action Guideline (PAG) values
4	- 208			Schedule Simulator-A for scenario development
5	- 205			Order binders, inserts, & index tabs for manuals, as required
6	- 198			Review recent USNRC / FEMA exercise reports
7	- 196			Select the objectives to be demonstrated
8	- 182			Develop extent-of-play criteria with State of AZ / Maricopa County
9	- 181			Establish Scenario Task Force (STF) / Scenario Review Board (SRB) staffing
10	- 180			Generate scenario foundation (STF duty)
11	- 167			Develop scenario timeline
12	- 165			Obtain Scenario Review Board (SRB) approval of core events & timeline
13	- 161			Identify ERO participant team(s): FSD: ____________ EXR: ____________
14	- 160			Obtain EP Department approval of objectives & extent-of-play
15	- 159			Ensure Full-Scale Drill / Exercise dates entered into Site Work Schedule

2.29 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 2 of 10 (sample)

FORM EP-0770 B

PVNGS EMERGENCY PLANNING

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 2 of 10)

FSD Number / Date: ***EXR Number / Date:***

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
16	- 155			Schedule Operations personnel for scenario development support
17	- 154	XXXXXXX		Develop Exercise meteorological data summary
18	- 152	XXXXXXX		Submit Exercise meteorological data request to NWS (NOAA)
19	- 130	XXXXXXX		Develop Exercise scenario on Simulator-A
20	- 123	XXXXXXX		Develop Exercise scenario Computer Aided Exercises (CAE)
21	- 111		XXXXXXX	Develop Full-Scale Drill scenario on Simulator-A
22	- 104		XXXXXXX	Develop Full-Scale Drill scenario Computer Aided Exercises (CAE)
23	- 101			Determine need for & extent of scenario mockup support materials
24	- 97	XXXXXXX		Generate 90-day submittal of objectives & extent-of-play criteria
25	- 97	XXXXXXX		◆ Transmit 90-day submittal to State of AZ for FEMA submittal
26	- 92	XXXXXXX		◆ Generate cover letter & transmit 90-day submittal to USNRC
27	- 85	XXXXXXX		Complete Exercise Simulator scenario development w/ Ops personnel
28	- 82		XXXXXXX	Complete Full-Scale Drill Simulator scenario development w/ Ops personnel
29	- 81		XXXXXXX	Develop Full-Scale Drill meteorological data summary
30	- 80		XXXXXXX	Submit Full-Scale Drill meteorological data request to NWS (NOAA)
31	- 79	XXXXXXX		Generate Exercise Manual Section-1 Introduction
32	- 79	XXXXXXX		Generate Exercise Manual Section-2 Objectives
33	- 79	XXXXXXX		Generate Exercise Manual Section-3 PV Guide
34	- 79	XXXXXXX		Generate Exercise Manual Section-4 PV Messages
35	- 79	XXXXXXX		Generate Exercise Manual Section-5 Offsite Guide

2.30 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 3 of 10 (sample)

FORM EP-0770B **PVNGS EMERGENCY PLANNING**

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 3 of 10)

FSD Number / Date: *EXR Number / Date:*

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
36	- 77	XXXXXXX		Generate Exercise Manual Section-6 Offsite Messages
37	- 77	XXXXXXX		Generate Exercise Manual Section-9 Equipment
38	- 77	XXXXXXX		Obtain Exercise meteorological data from NWS (NOAA)
39	- 76	XXXXXXX		Generate Exercise Manual Section-8 Meteorological
40	- 74	XXXXXXX		Generate Exercise Manual Section-7 Chem / Rad
41	- 73	XXXXXXX		Develop Exercise IPZ data, if required
42	- 73	XXXXXXX		Generate Exercise Manual Section-0 Control Data
43	- 73	XXXXXXX		Determine / establish Exercise Control Cell requirements
44	- 73	XXXXXXX		◆ Obtain verbal approval of objectives / extent-of-play from FEMA
45	- 72	XXXXXXX		◆ Obtain verbal approval of objectives / extent-of-play from USNRC
46	- 70	XXXXXXX		Ensure scenario & data satisfy USNRC / FEMA minimum requirements
47	- 70	XXXXXXX		Produce master prototype Exercise Manual
48	- 69	XXXXXXX		Produce master prototype Exercise IPZ Manual, if required
49	- 68	XXXXXXX		Finalize 60-day submittal materials with Scenario Review Board (SRB)
50	- 67	XXXXXXX		Finalize 60-day submittal materials with Scenario Task Force (STF)
51	- 66	XXXXXXX		Generate 60-day submittal of Exercise / IPZ Manuals & materials
52	- 65	XXXXXXX		◆ Transmit 60-day submittal to State of AZ for FEMA submittal
53	- 65	XXXXXXX		◆ Generate cover letter & transmit 60-day submittal to USNRC
54	- 64			Reserve EIC Auditorium for Full-Scale Drill / Exercise Player Briefings
55	- 58			Verify Simulator-A availability for Full-Scale Drill / Exercise

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2.31 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 4 of 10 (sample)

FORM EP-0770B **PVNGS EMERGENCY PLANNING**

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 4 of 10)

FSD Number / Date: ***EXR Number / Date:***

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
56	- 58			Generate Full-Scale Drill / Exercise Control Organization position list
57	- 58		XXXXXXX	Generate Full-Scale Drill Manual Section-1 Introduction
58	- 58		XXXXXXX	Generate Full-Scale Drill Manual Section-2 Objectives
59	- 58		XXXXXXX	Generate Full-Scale Drill Manual Section-3 PV Guide
60	- 56		XXXXXXX	Generate Full-Scale Drill Manual Section-4 PV Messages
61	- 56		XXXXXXX	Generate Full-Scale Drill Manual Section-5 Offsite Guide
62	- 56		XXXXXXX	Generate Full-Scale Drill Manual Section-6 Offsite Messages
63	- 55		XXXXXXX	Generate Full-Scale Drill Manual Section-9 Equipment
64	- 53		XXXXXXX	Obtain Full-Scale Drill meteorological data from NWS (NOAA)
65	- 52		XXXXXXX	Generate Full-Scale Drill Manual Section-8 Meteorological
66	- 52		XXXXXXX	Generate Full-Scale Drill Manual Section-7 Chem / Rad
67	- 52		XXXXXXX	Develop Full-Scale Drill IPZ data, if required
68	- 50		XXXXXXX	Generate Full-Scale Drill Manual Section-0 Control Data
69	- 49		XXXXXXX	Ensure "dry runs" of scenario have been validated with use of all CAEs
70	- 49		XXXXXXX	Obtain additional MTS2000 radios from Security for Full-Scale Drill use
71	- 49		XXXXXXX	Produce master prototype Full-Scale Drill Manual
72	- 49		XXXXXXX	Produce master prototype Full-Scale Drill IPZ Manual, if required
73	- 49		XXXXXXX	Finalize Full-Scale Drill materials with Scenario Review Board (SRB)
74	- 47		XXXXXXX	Finalize Full-Scale Drill materials with Scenario Task Force (STF)
75	- 47		XXXXXXX	Request reproduction of ______ Full-Scale Drill Manuals

2.32 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 5 of 10 (sample)

FORM EP-0770 PVNGS EMERGENCY PLANNING

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 5 of 10)

FSD Number / Date: *EXR Number / Date:*

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
76	- 47		XXXXXXX	Request reproduction of ______ Full-Scale Drill IPZ Manuals, if required
77	- 45		XXXXXXX	Secure reproduction of Full-Scale Drill Manuals
78	- 43		XXXXXXX	Secure reproduction of Full-Scale Drill IPZ Manuals as required
79	- 43		XXXXXXX	Determine / establish Full-Scale Drill Control Cell requirements
80	- 43		XXXXXXX	Conduct offsite Initial Controller Training, if required
81	- 43		XXXXXXX	Conduct onsite Initial Controller Training, if required
82	- 42		XXXXXXX	Identify Full-Scale Drill Operations personnel participants
83	- 42		XXXXXXX	Verify readiness of applicable scenario mockup materials
84	- 42		XXXXXXX	Notify ADEM of Full-Scale Drill
85	- 42		XXXXXXX	Notify Air-Evac of Full-Scale Drill
86	- 42		XXXXXXX	Notify APS Communications of Full-Scale Drill
87	- 42		XXXXXXX	Notify APS Energy Control Center of Full-Scale Drill
88	- 42		XXXXXXX	Notify APS Media Relations of Full-Scale Drill
89	- 42		XXXXXXX	Notify APS Security of Full-Scale Drill
90	- 42		XXXXXXX	Notify APS Telephone Operator of Full-Scale Drill
91	- 42		XXXXXXX	Notify APS Vice President - Nuclear of Full-Scale Drill
92	- 42		XXXXXXX	Notify Area Municipal Mayors of Full-Scale Drill
93	- 42		XXXXXXX	Notify ARRA of Full-Scale Drill
94	- 42		XXXXXXX	Notify AZ DPS of Full-Scale Drill
95	- 42		XXXXXXX	Notify DOE of Full-Scale Drill

2.33 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 6 of 10 (sample)

FORM EP-0770B **PVNGS EMERGENCY PLANNING**

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 6 of 10)

FSD Number / Date: ***EXR Number / Date:***

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
96	- 42		XXXXXXX	Notify FEMA of Full-Scale Drill
97	- 42		XXXXXXX	Notify Good Samaritan Medical Center of Full-Scale Drill
98	- 42		XXXXXXX	Notify Maryvale Samaritan Hospital of Full-Scale Drill
99	- 42		XXXXXXX	Notify MCDEM of Full-Scale Drill
100	- 42		XXXXXXX	Notify MCSO of Full-Scale Drill
101	- 42		XXXXXXX	Notify National Weather Service (NOAA) of Full-Scale Drill
102	- 42		XXXXXXX	Notify SRP Power Dispatch Operator of Full-Scale Drill
103	- 42		XXXXXXX	Notify USNRC of Full-Scale Drill
104	- 42		XXXXXXX	Submit Simulator-A Full-Scale Drill telecommunications request
105	- 41		XXXXXXX	Submit catering request for Full-Scale Drill
106	- 41		XXXXXXX	Disseminate Full-Scale Drill email memo to all ERO personnel
107	- 41		XXXXXXX	Conduct offsite Full-Scale Drill Controller Briefing (disseminate manuals)
108	- 41		XXXXXXX	Conduct onsite Full-Scale Drill Controller Briefing (disseminate manuals)
109	- 41		XXXXXXX	Review applicable E-Plan Kit inventories
110	- 41		XXXXXXX	Ensure adequate supplies of colored armbands / lapel badges exist
111	- 41		XXXXXXX	Identify / produce Full-Scale Drill Player handouts (rules, briefing)
112	- 40		XXXXXXX	Disseminate Full-Scale Drill site-wide communication
113	- 40		XXXXXXX	◆ Complete Full-Scale Drill Control Organization staff list
114	- 40		XXXXXXX	◆ Conduct offsite Full-Scale Drill Player Briefing
115	- 40		XXXXXXX	◆ Conduct onsite Full-Scale Drill Player Briefing

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2.34 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 7 of 10 (sample)

FORM EP-0770 B PVNGS EMERGENCY PLANNING

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 7 of 10)

FSD Number / Date: **EXR Number / Date:**

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
116	- 36		XXXXXXX	Obtain restricted list of Full-Scale Drill observers & evaluators
117	- 36		XXXXXXX	Verify Full-Scale Drill Control Cell telecommunications configuration
118	- 36		XXXXXXX	Ensure Simulator-A procedures are current
119	- 36		XXXXXXX	Verify Simulator-A Computer Room RMS / MESOREM functionality
120	- 36		XXXXXXX	Verify Simulator Support personnel (hardware, software) availability
121	- 35		XXXXXXX	Verify Simulator-A Full-Scale Drill telecommunications configuration
122	- 35		XXXXXXX	Perform logistics material checks
123	- 35		XXXXXXX	◆ Conduct Full-Scale Drill
124	- 35		XXXXXXX	◆ Conduct Full-Scale Drill facility critiques
125	- 34		XXXXXXX	Continue Full-Scale Drill IPZ segment as required
126	- 33		XXXXXXX	Conduct Full-Scale Drill management briefing / critique
127	- 30	XXXXXXX		Incorporate "lessons learned" from Full-Scale Drill into Exercise
128	- 14	XXXXXXX		Ensure "dry runs" of scenario have been validated with use of all CAEs
129	- 14	XXXXXXX		Obtain additional MTS2000 radios from Security for Exercise use
130	- 14	XXXXXXX		Finalize Exercise materials with Scenario Review Board (SRB)
131	- 12	XXXXXXX		Finalize Exercise materials with Scenario Task Force (STF)
132	- 12	XXXXXXX		Request reproduction of ______ Exercise Manuals
133	- 12	XXXXXXX		Request reproduction of ______ Exercise IPZ Manuals, if required
134	- 10	XXXXXXX		Secure reproduction of Exercise Manuals
135	- 8	XXXXXXX		Secure reproduction of Exercise IPZ Manuals as required

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2.35 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 8 of 10 (sample)

FORM EP-0770B PVNGS EMERGENCY PLANNING

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 8 of 10)

FSD Number / Date: EXR Number / Date:

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
136	- 8	XXXXXXX		Conduct offsite Initial Controller Training as required
137	- 8	XXXXXXX		Conduct onsite Initial Controller Training as required
138	- 7	XXXXXXX		Identify Exercise Operations personnel participants
139	- 7	XXXXXXX		Verify readiness of applicable scenario mockup materials
140	- 7	XXXXXXX		Notify ADEM of Exercise
141	- 7	XXXXXXX		Notify Air-Evac of Exercise
142	- 7	XXXXXXX		Notify APS Communications of Exercise
143	- 7	XXXXXXX		Notify APS Energy Control Center of Exercise
144	- 7	XXXXXXX		Notify APS Media Relations of Exercise
145	- 7	XXXXXXX		Notify APS Security of Exercise
146	- 7	XXXXXXX		Notify APS Telephone Operator of Exercise
147	- 7	XXXXXXX		Notify APS Vice President - Nuclear of Exercise
148	- 7	XXXXXXX		Notify Area Municipal Mayors of Exercise
149	- 7	XXXXXXX		Notify ARRA of Exercise
150	- 7	XXXXXXX		Notify AZ DPS of Exercise
151	- 7	XXXXXXX		Notify DOE of Exercise
152	- 7	XXXXXXX		Notify FEMA of Exercise
153	- 7	XXXXXXX		Notify Good Samaritan Medical Center of Exercise
154	- 7	XXXXXXX		Notify Maryvale Samaritan Hospital of Exercise
155	- 7	XXXXXXX		Notify MCDEM of Exercise

2.36 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 9 of 10 (sample)

FORM EP-0770B PVNGS EMERGENCY PLANNING

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 9 of 10)

FSD Number / Date: *EXR Number / Date:*

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
156	- 7	XXXXXXX		Notify MCSO of Exercise
157	- 7	XXXXXXX		Notify National Weather Service (NOAA) of Exercise
158	- 7	XXXXXXX		Notify SRP Power Dispatch Operator of Exercise
159	- 7	XXXXXXX		Notify USNRC of Exercise
160	- 7	XXXXXXX		Finalize Exercise Control Cell requirements
161	- 7	XXXXXXX		Submit Simulator-A Exercise telecommunications request
162	- 6	XXXXXXX		Submit catering request for Exercise
163	- 6	XXXXXXX		Disseminate Exercise email memo to all ERO personnel
164	- 6	XXXXXXX		Conduct offsite Exercise Controller Briefing (disseminate manuals)
165	- 6	XXXXXXX		Conduct onsite Exercise Controller Briefing (disseminate manuals)
166	- 6	XXXXXXX		Review applicable E-Plan Kit inventories
167	- 6	XXXXXXX		Ensure adequate supplies of colored armbands / lapel badges exist
168	- 6	XXXXXXX		Identify / produce Exercise Player handouts (rules, briefing)
169	- 5	XXXXXXX		Disseminate Exercise site-wide communication
170	- 5	XXXXXXX		◆ Complete Exercise Control Organization staff list
171	- 5	XXXXXXX		◆ Conduct offsite Exercise Player Briefing
172	- 5	XXXXXXX		◆ Conduct onsite Exercise Player Briefing
173	- 1	XXXXXXX		Obtain restricted list of Exercise observers & evaluators
174	- 1	XXXXXXX		Verify Exercise Control Cell telecommunications configuration
175	- 1	XXXXXXX		Ensure Simulator-A procedures are current

2.37 Form EP-0770, Full-Scale Drill / Exercise Checklist, page 10 of 10 (sample)

FORM EP-0770B **PVNGS EMERGENCY PLANNING**

FULL-SCALE DRILL / EXERCISE CHECKLIST (Part 10 of 10)

FSD Number / Date: *EXR Number / Date:*

SEQ	DAYS	DATE (FSD)	DATE (EXR)	ACTION
176	- 1	XXXXXXX		Verify Simulator-A Computer Room RMS / MESOREM functionality
177	- 1	XXXXXXX		Verify Simulator Support personnel (hardware, software) availability
178	0	XXXXXXX		Verify Simulator-A Exercise telecommunications configuration
179	0	XXXXXXX		Perform logistics material checks
180	0	XXXXXXX		◆ Conduct Exercise
181	0	XXXXXXX		◆ Conduct Exercise facility critiques
182	+ 1	XXXXXXX		Continue Exercise IPZ segment as required
183	+ 2	XXXXXXX		Conduct Exercise management briefing / critique
184	+ 2	XXXXXXX		Attend USNRC exit briefing, if applicable
185	+ 2	XXXXXXX		Attend FEMA exit briefing, if applicable

2.38 Form EP-0773, Training Drill Checklist (sample)

FORM EP-0773B **PVNGS EMERGENCY PLANNING**

TRAINING DRILL CHECKLIST

Type:				*Number:*
SEQ	**DAYS**	**DATE**	**INITIALS**	**ACTION**
1	- 014			Verify date and time
2	- 014			Identify response team
3	- 014			Identify and establish Player requests
4	- 010			Select objectives
5	- 010			Identify extent-of-play criteria
6	- 007			Identify offsite organization participation criteria
7	- 007			Establish Simulator-A telecommunications request
8	- 007			Review / validate scenario and timeline
9	- 006			Identify / develop required support data
10	- 006			Identify / assign Controllers
11	- 005			Determine / establish Control Cell requirements
12	- 005			Disseminate email memo to all ERO personnel
13	- 002			Produce site-wide announcement w/ Strat. Comm.
14	- 002			Identify / produce Player handouts *(list, rules, briefing)*
15	- 001			Verify Player assignments
16	- 001			Verify Simulator-A Computer Room RMS DCU and dose projection software functionality
17	- 001			Organize / conduct Controller pre-briefing
18	- 001			Distribute scenario package to Controllers: • Attendance sheets • Control Cell telephone numbers • EP Comment forms • Session briefing outline *(purpose, objectives, extent-of-play, facilities activated, telecommunications, documentation)* • Scenario *(as necessary)* • Controller badge / arm-band • Critique guideline • E-Kit seals • Scenario support data
19	- 000			Verify Simulator-A telecommunications configuration
20	- 000			Conduct training drill
21	- 000			Conduct facility critiques
22	- 000			Verify Simulator A telecommunications to Simulator mode
Comments:				

2.39 Form EP-0774, Scenario Development Data Confidentiality (sample)

FORM EP-0774A PVNGS EMERGENCY PLANNING

SCENARIO DEVELOPMENT DATA CONFIDENTIALITY

SUMMARY

An emphasis on scenario confidentiality and suspicion of Exercise participant preparation perceived by the United States Nuclear Regulatory Commission *(USNRC)* makes the control of scenario data essential. If any suspicion of scenario compromise exists, the NRC may invalidate the Exercise scenario and request a full remedial performance.

You are required to maintain full control of Drill / Exercise material and data in accordance with 84DP-0RM32, Handling of Proprietary, Confidential, and Company Confidential Information, when in support of scenario development personnel. Any reproduction, distribution, or communication of material and/or data, or content of same, to unauthorized personnel is strictly prohibited. Elimination of scenario data or related material shall be accomplished only via a full-page paper shredder. Transfer of material shall take place within the confines of packaging clearly marked as "CONFIDENTIAL." Delegation of typing and/or reproduction of related material shall take place under the auspices of scenario development personnel.

The practice of reasonable caution with respect to scenario data will prevent any inference of participant preparation. The potential minimal gains offered by "leaking" data to participants is tremendously offset by the consequences of suspicion of compromise. A remedial Exercise would generate substantial expenses in personnel time, has provisions for operational impacts, and would have the potential of possible civil penalties levied against Arizona Public Service Company by the USNRC. In addition, evaluators may lose confidence in PVNGS and, as a result, exercise increased diligence in their reappraisal of plant and personnel performance.

Confidentiality of any specific scenario data shall no longer be required upon conclusion of the scenario pertaining to the specific data for which it applies. This Confidentiality Agreement shall terminate upon conclusion of all scenarios applicable to data development undertaken for purposes relating to said Drills and/or Exercises and shall not require written individual relinquishment of statement bounds.

As a contributor to or member of the scenario development group, I have read the provisions stated above and understand their importance concerning data confidentiality.

NAME: ______________________________
(print)

SIGNATURE: ______________________________

DATE: ________________