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Re: Entire EAL Basis Document (Table of Contents Rev) (Copy 91)

PSM Title: n/a

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Please perform the following to your assigned manual. If you have any questions regarding this TAM please contact Don A. Johnson at 319-851-7872.

	REMOVE	INSERT
EAL Table of Contents Revision	Rev. 11	Rev. 12
EAL EBD-A (PWR: 19688)	Rev. 4	Rev. 5

PERFORMED BY:

Print Name ____________ Sign Name ____________ Date ____________

Please return to: K. Dunlap
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To be completed by DAEC EP personnel only:
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A045

PROCEDURE	TITLE	REV #	REV. DATE
	Introduction	1	2/01/2000
	Definitions	1	2/01/2000
	Organization of Basis Information	2	8/8/2002
EBD-A	Abnormal Rad Levels/Radiological Effluent Category	5	12/13/2002
EBD-F	Fission Product Barrier Degradation Category	3	11/20/2000
EBD-H	Hazards and Other Conditions Affecting Plant Safety Category	4	8/8/2002
EBD-S	System Malfunction Category	4	9/30/2002

Effective Date: 12-13-02

TECHNICAL REVIEW

Prepared by: [signature] Date: 12/6/02

Reviewed by: [signature] Date: 12/6/02
Independent Reviewer

PROCEDURE APPROVAL

I am responsible for the technical content of this procedure and for obtaining the necessary approval from the State and County Emergency Management officials prior to implementation.

Documentation of ~~State and County Emergency Management~~ approval is via 12/6/02
NEP- 2002-074 .

Approved by: [signature] Date: 12/6/2002
Manager, Emergency Planning

Table of Contents

AU1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment That Exceeds Two Times the Offsite Dose Assessment Manual (ODAM) Limit and is Expected to Continue For 60 Minutes or Longer

EVENT TYPE: Offsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2 or 3 or 4)

1. A valid reading on radiation monitors that corresponds to a release that is expected to exceed 2X ODAM level for 60 minutes or longer as indicated by:

   Reactor Building or Turbine Building ventilation (Kaman) rad monitor reading above 1 E-3 µCi/cc.

   OR

   Offgas Stack (Kaman) rad monitor reading above 1 E-1 µCi/cc.

   OR

   LLRPSF (Kaman) rad monitor reading above 5 E-4 µCi/cc.

   OR

   GSW rad monitor reading above 3E+3 CPS.

   OR

   RHRSW & ESW rad monitor reading above 8E+2 CPS.

   OR

   RHRSW & ESW Discharge Canal rad monitor reading above 1E+3 CPS.

2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration expected to exceed 60 minutes in excess of 2X ODAM limit.

3. Valid perimeter radiation monitor reading of greater than 0.10 mR/hr above normal background for 60 minutes.

4. Valid dose assessment indicating dose rates beyond the site boundary above 0.1 mR/hr TEDE for a period greater than 60 minutes.

DAEC EAL INFORMATION:

Valid means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results.

UNPLANNED, as used in this context, includes any release for which a radioactivity 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. The Emergency Director 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. Also, if an ongoing release is detected and the starting time for that release is unknown, the Emergency Director should, in the absence of data to the contrary, assume that the release has exceeded 60 minutes.

The approach taken for calculation of gaseous radioactive effluent EAL setpoints includes use of the ODAM Table 3-2 source term computed by BWR-GALE for the DAEC Base Case. The release is assumed to be from a single release point. Multiple release points would be difficult to present as explicit EAL threshold values and in any case, are addressed by off-site dose assessment by MIDAS, which is the preferred method for determining this condition. The calculation methods for setpoint determination are from ODAM Section 3.4 and are based on Regulatory Guide 1.109 methodology. The table below lists the results of the gaseous effluent EAL calculations. The Kaman extended range capability is used because the General Electric Offgas Stack monitor has a limited range.

	Gaseous Effluent EALs			
	Offgas Stack Kaman 9/10		Turbine Bldg (Kaman 1/2) and Reactor Bldg (Kaman 3/4, 5/6, 7/8)	
Maximum flow (CFM)	10,000		72,000	
Release Limits	Concentration (µCi/cc)	Release Rate (µCi/sec)	Concentration (µCi/cc)	Release Rate (µCi/sec)
Tech Spec	1.1E-1	5.2E+5	6.2E-4	2.1E+4
Unusual Event (2 x TS)	2.0E-1	1.0E+6	1.2E-3	4.2E+4
Alert (60 x TS)	6.0E+0	3.0E+7	3.7E-2	1.3E+6
	LLRPSF Kaman 12			
Maximum flow (CFM)	99,000			
Release Limits	Concentration (µCi/cc)		Release Rate (µCi/sec)	
Tech Spec	5.9E-4		2.8E+4	
Unusual Event (2 x TS)	1.0E-3		5.6E+4	
Alert (200 x TS)	1.0E-1		5.6E+6	

The off-gas stack is treated as an elevated release and the turbine building and reactor building vents are treated as mixed-mode releases. The ground level setpoints are taken from the default setpoint calculations from the quarterly surveillance tests performed by DAEC Chemistry technicians. Reactor Building, Turbine Building, LLRPSF (Low Level Radwaste Processing and Storage Facility) and Offgas Stack Noble Gas Monitor alarm setpoints are calculated based on achieving the Tech Spec instantaneous release limit, assuming annual average meteorology as defined in the ODAM. The Tech Spec Limit currently corresponds to a reactor building or turbine building ventilation alarm setpoint of 6.2 E-04 µCi/cc. The monitor alarm setpoint can be periodically adjusted but typically does not vary by much. The DAEC EAL therefore addresses valid radiation levels exceeding 2 times the alarm setpoint for greater than 60 minutes. Rounded off, this corresponds to 1 E-3 µCi/cc. The corresponding offgas stack monitor value is 1.1E-1 µCi/cc, rounded off to 1 E-1 µCi/cc. The Tech Spec Limit currently for the LLRPSF building ventilation alarm setpoint is 5.9 E-04 µCi/cc. The DAEC EAL therefore addresses valid radiation levels exceeding 2 times the alarm setpoint for greater than 60 minutes. This corresponds to 1 E-3 µCi/cc.

Technical specification setpoints for radioactive liquid radiation monitors are 10 times the 10 CFR 20 Appendix B, Table 2, Water Effluent Concentration (WEC) limits. It is the policy of DAEC to process all liquid radwaste so that no release of radioactive liquid to the environment is allowed. The radwaste effluent line which could be used as a batch release mechanism has a trip function that prevents exceeding the DAEC release limit, however, an EAL has been provided. The other pathways to the environment (RHRSW - to cooling tower, RHRSW - to discharge canal) have radiation monitors with readouts going to the

Control Room. These systems could become contaminated if heat exchanger leaks develop; however, historically this has not occurred in the service water systems at DAEC. These monitors are displayed on panels 1C02 and 1C10.

Reactor water is the likely source of contamination through the service water systems as opposed to floor drain, detergent drain, and chemical waste discharge. The floor drain and detergent drains go to Radwaste Processing and would be batch released to the Radwaste effluent discharge line (if such a release were to occur). The chemical discharge sump is normally a radioactivity clean system and is tested by Chemistry to ensure no contamination prior to discharging to the canal.

The setpoints for the three service water radiation effluent monitors vary because of differences in detector efficiencies and background. Setpoints based on the same reactor water sample are listed below to show the differences. The rounded off readings will be used for the EALs for ease of reading the monitor scales.

Monitor	TS Limit	Reading	UE Level	Alert Level
GSW	1,555 CPS	1.5E+3 CPS	3E+3 CPS	3E+5 CPS
RHRSW & ESW to cooling tower	413 CPS	4E+2 CPS	8E+2 CPS	8E+4 CPS
RHRSW & ESW to Discharge Canal	507 CPS	5E+2 CPS	1E+3 CPS	1E+5 CPS

There are no significant deviations from the generic EALs. However, DAEC does not have a telemetered radiation monitoring system. As an alternative, use of field instruments was considered. It is not practical to establish an EAL based on field survey readings of 0.1 mR/hr for greater than 60 minutes because field instruments in use for emergency response do not have a threshold of detection to meet such criteria.

Hourly Whole Body Dose Corresponding to 2 x ODAM Limit for Gaseous Release

ODAM limit = 500 mrem/year Whole Body Dose

2 x **ODAM** limit = [2 x 500 mrem/year]/8760 hours/year = 0.114 mrem Whole Body in one hour

Rounded off to 0.1 mrem

Dose assessment using MIDAS is based on the EPA-400 methodology, *e.g.*, use of Total Effective Dose Equivalent (TEDE). This is somewhat different from whole body dose from gaseous effluents determined by ODAM methodology which forms the basis for the

radiation monitor readings calculated in accordance with the generic methodology. The gaseous effluent radiation monitors can only detect noble gases. The contribution of iodine's to TEDE could therefore only be determined either by: (1) utilizing MIDAS, or (2) gaseous effluent sampling. DAEC EAL 4 is written in terms of TEDE and the gaseous effluent radiation monitor readings are determined based on ODAM.

REFERENCES:

1: Offsite Dose Assessment Manual Section 6.1.2 and 7.1.2 Bases
2. Emergency Plan Implementing Procedure (EPIP) 3.3, Dose Assessment and Protective Action
3. Radiation Protection Calculation No. 95-001-C, Emergency Actions Levels Based on Effluent Radiation Monitors, January 24, 1995
4. UFSAR Section 11.5, Process and Effluent Radiation Monitoring and Sampling Systems
5. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

AU2 Unexpected Increase in Plant Radiation

EVENT TYPE: Onsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2 or 3 or 4)

1. Valid WR GEMAC Floodup indication (LI-4541) coming on scale in the reactor refueling cavity with all irradiated fuel assemblies remaining covered by water or valid field report to Control Room of same.
2. Valid fuel pool level indication (LI-3413) below 36 feet and lowering with all irradiated fuel assemblies remaining covered by water or valid field report to Control Room of same.
3. Valid radiation reading for irradiated spent fuel in dry storage ≥ 0.1mR/hr.
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.

DAEC EAL INFORMATION:

There are no significant deviations from the generic EALs. DAEC does not have a spent fuel transfer canal or on-site dry storage of spent fuel.

Uncontrolled means that the condition is not the result of planned actions by the plant staff in accordance with procedures. *Valid* means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results.

There are three methods to determine water level decreases of concern. The first method is by report to the control room. The other methods include use of the Floodup level indicator and the spent fuel pool level indicator. These are further described below.

During preparation for reactor cavity flood up prior to entry into refuel mode, reactor vessel level instrument LI-4541 (WR GEMAC, FLOODUP) on control room panel 1C04 is placed in service by I&C personnel connecting a compensating air signal after the reference leg is disconnected from the reactor head. Normal refuel water level is above the top of the span of this flood up level indicator. A valid indication (*e.g.*, not due to loss of compensating air

signal or other instrument channel failure) of reactor cavity level coming on span for this instrument is used at DAEC as an indicator of uncontrolled reactor cavity level decrease.

DAEC Technical Specifications require a minimum of 36 feet of water in the spent fuel pool. During refueling, the gates between the reactor cavity and the refueling cavity are removed and the spent fuel pool level indicator LI 3413 is used to monitor refueling water level. Procedures require that a normal refueling water level be maintained at 37 feet 5 inches. A low level alarm actuates when spent fuel pool level drops below 37 feet 1 inch. Symptoms of inventory loss at DAEC include visual observation of decreasing water levels in reactor cavity or spent fuel storage pool, Reactor Building (RB) fuel storage pool radiation monitor or refueling area radiation monitor alarms, observation of a decreasing trend on the spent fuel pool water level recorder, and actuation of the spent fuel pool low water level alarm. To eliminate minor level perturbations from concern, DAEC uses LI 3413 indicated water level below 36 feet and lowering.

Increased radiation levels can be detected by the local refueling floor area radiation monitors, the refueling floor Continuous Air Monitor (CAM) alarm, refueling areas radiation monitors, fuel pool ventilation exhaust monitors, and by Standby Gas Treatment (SGBT) System automatic start. Applicable area radiation monitors include those that are displayed on Panel 1C02 and alarmed on Panel 1C04B. The DAEC EAL has also been written to reflect the case where an ARM may go offscale high prior to reaching 1,000 times the normal reading.

NOTE: On Annunciator Panel 1C04B, the indicators listed below are expected alarms during pre-planned transfers of highly radioactive material through the affected area. If an HP Technician is present, sending an Operator is not required. Radiation levels other than those expected should be promptly investigated. The indicators are high radiation alarms from the Hot Laboratory or Administrative Building, the new fuel storage area, and the radwaste building.

REFERENCES:

1. Alarm Response Procedure (ARP) 1C04B, Reactor Water Cleanup and Isolation
2. Technical Specification 3.7.8, Spent Fuel Pool Water Level
3. Emergency Plan Implementing Procedure (EPIP) 3.1, Inplant Radiological Monitoring, Attachment 1, ARM Locations
4. Emergency Operating Procedures (EOP) Basis Document, Breakpoints for RC/L & L
5. Surveillance Test Procedure (STP) 3.0.0.0-01PA, Daily and Shift Instrument Checks
6. Integrated Plant Operating Instruction (IPOI) 8 , Outage and Refueling Operations
7. Fuel & Reactor Component Handling Procedure (F&RCHP) 5, Procedure for Moving Core Components Between Reactor Core and Spent Fuel Pool, Within the Reactor Core, or Within the Spent Fuel Pool
8. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

AA1 Any Unplanned Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200X the Offsite Dose Assessment Manual (ODAM) Limit and is Expected to Continue for 15 Minutes or Longer

EVENT TYPE: Offsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2 or 3 or 4)

1. A valid reading on radiation monitors that corresponds to 200X ODAM level as indicated by any of the following:

   Reactor Building or Turbine Building ventilation (Kaman) rad monitor reading above 3 E-2 µCi/cc and expected to last for 15 minutes or longer.

   OR

   Offgas Stack (Kaman) rad monitor reading above 6 E+0 µCi/cc and expected to last for 15 minutes or longer.

   OR

   LLRPSF (Kaman) rad monitor reading above 1 E-1 µCi/cc and expected to last for 15 minutes or longer.

   OR

   GSW rad monitor reading above 3E+5 CPS and expected to last for 15 minutes or longer.

   OR

   RHRSW & ESW rad monitor reading above 8E+4 CPS and expected to last for 15 minutes or longer.

   OR

   RHRSW & ESW Discharge Canal rad monitor reading above 1E+5 CPS and expected to last for 15 minutes or longer .

2. Confirmed sample analyses for gaseous or liquid releases indicates concentrations or release rates with a release duration expected to last for 15 minutes or longer in excess of 200X ODAM limit.

3. Valid site boundary radiation reading of greater than 10 mR/hr above normal background and expected to last for 15 minutes or longer.

4. Valid indication on MIDAS of a release greater than 200X ODAM limit and expected to last for 15 minutes or longer.

DAEC EAL INFORMATION:

Valid means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results. In a case where data from Kaman readings is being used to determine whether an EAL threshold value has been exceeded, *Valid* means that flow through the associated Kaman Monitor has been verified and does exist as indicated in uCi/sec on SPRAD.

UNPLANNED, as used in this context, includes any release for which a radioactivity 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. The Emergency Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the Emergency Director should, in the absence of data to the contrary, assume that the release has exceeded 15 minutes.

Gaseous Effluent EALs				
	Offgas Stack Kaman 9/10		Turbine Bldg (Kaman 1/2) and Reactor Bldg (Kaman 3/4, 5/6, 7/8)	
Maximum flow (CFM)	10,000		72,000	
Release Limits	Concentration (µCi/cc)	Release Rate (µCi/sec)	Concentration (µCi/cc)	Release Rate (µCi/sec)
Tech Spec	1.1E-1	5.2E+5	6.2E-4	2.1E+4
Unusual Event (2 x TS)	2.0E-1	1.0E+6	1.2E-3	4.2E+4
Alert (60 x TS)	6.0E+0	3.0E+7	3.7E-2	1.3E+6
	LLRPSF Kaman 12			
Maximum flow (CFM)	99,000			
Release Limits	Concentration (µCi/cc)	Release Rate (µCi/sec)		
Tech Spec	5.9E-4	2.8E+4		
Unusual Event (2 x TS)	1.0E-3	5.6E+4		
Alert (200 x TS)	1.0E-1	5.6E+6		

The off-gas stack is treated as an elevated release and the turbine building and reactor building vents are treated as mixed-mode releases. The ground level setpoints are taken from the default setpoint calculations from the quarterly surveillance tests performed by DAEC Chemistry technicians. Reactor Building, Turbine Building, LLRPSF (Low Level Radwaste Processing and Storage Facility) and Offgas Stack Noble Gas Monitor alarm setpoints are calculated based on achieving the Tech Spec instantaneous release limit assuming annual average meteorology as defined in the ODAM. The Tech Spec Limit currently corresponds to a reactor building or turbine building ventilation alarm setpoint of 6.2 E-4 µCi/cc. The monitor alarm setpoint can be periodically adjusted but typically does not vary by much. For the Offgas Stack, Reactor Building and Turbine building KAMAN monitor readings, DAEC chose to multiply the technical specification concentration by a factor of 60 (instead of 200) in order to allow for a logical step progression in monitor setpoints from the AU1 through AA1 to AS1. The DAEC EAL therefore addresses valid radiation levels exceeding 60 times the alarm setpoint for greater than 15 minutes. Rounded down, this corresponds to 3 E-2 µCi/cc. The corresponding offgas stack monitor value is 6.6 µCi/cc, rounded down to 6 E+0 µCi/cc. The Tech Spec Limit currently for the LLRPSF building ventilation alarm setpoint is 5.9 E-04 µCi/cc. The DAEC EAL therefore addresses valid radiation levels exceeding 200 times the alarm setpoint for greater than 15 minutes. This corresponds to 1 E-1 µCi/cc.

Technical specification setpoints for radioactive liquid radiation monitors are 10 times the 10 CFR 20 Appendix B, Table 2, Water Effluent Concentration (WEC) limits. It is the policy of DAEC to process all liquid radwaste so that no release of radioactive liquid to the

environment is allowed. The radwaste effluent line which could be used as a batch release mechanism has a trip function that prevents exceeding the DAEC release limit, and therefore no EAL limits are provided. The other pathways to the environment (RHRSW - to cooling tower, RHRSW - to discharge canal) have radiation monitors with readouts going to the Control Room. These systems could become contaminated if heat exchanger leaks develop; however, historically this has not occurred in the service water systems at DAEC. These monitors are displayed on panels 1C02 and 1C10.

Reactor water is the likely source of contamination through the service water systems as opposed to floor drain, detergent drain, and chemical waste discharge. The floor drain and detergent drains go to Radwaste Processing and would be batch released to the Radwaste effluent discharge line (if such a release were to occur). The chemical discharge sump is normally a radioactivity clean system and is tested by Chemistry to ensure no contamination prior to discharging to the canal.

The setpoints for the three service water radiation effluent monitors vary because of differences in detector efficiencies and background. Setpoints based on the same reactor water sample are listed below to show the differences. The rounded off readings will be used for the EALs for ease of reading the monitor scales.

Monitor	TS Limit	Reading	UE Level	Alert Level
GSW	1,555 CPS	1.5E+3 CPS	3E+3 CPS	3E+5 CPS
RHRSW & ESW to cooling tower	413 CPS	4E+2 CPS	8E+2 CPS	8E+4 CPS
RHRSW & ESW to Discharge Canal	507 CPS	5E+2 CPS	1E+3 CPS	1E+5 CPS

DAEC does not have a telemetered radiation monitoring system. As an alternative, DAEC uses valid field survey readings outside the site boundary greater than 10 mR/hr or greater than 50 mR/hr CDE Thyroid.

Hourly Whole Body Dose Corresponding to 200 x ODAM Limit for Gaseous Release

ODAM limit = 500 mrem/year Whole Body

200 x **ODAM** limit = [200 x 500 mrem/year]/8760 hours/year = 11.4 mrem Whole Body in one hour

Rounded off to 10 mrem

Dose assessment using MIDAS is based on the EPA-400 methodology, *e.g.*, use of Total Effective Dose Equivalent (TEDE). This is somewhat different from whole body dose from

gaseous effluents determined by ODAM methodology which forms the basis for the radiation monitor readings calculated in AU1 in accordance with the generic methodology. The gaseous effluent radiation monitors can only detect noble gases. The contribution of iodine's to TEDE could therefore only be determined either by: (1) utilizing MIDAS, or (2) gaseous effluent sampling. DAEC EAL 4 is written in terms of TEDE and the gaseous effluent radiation monitor readings are determined based on ODAM.

REFERENCES:

1. Offsite Dose Assessment Manual Section 6.1.2 and 7.1.2 Bases
2. Emergency Plan Implementing Procedure (EPIP) 3.3, Dose Assessment and Protective Action
3. Radiation Protection Calculation No. 95-001-C, Emergency Actions Levels Based on Effluent Radiation Monitors, January 24, 1995
4. UFSAR Section 11.5, Process and Effluent Radiation Monitoring and Sampling Systems
5. EPA 400-R-92-001, *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*
6. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

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

EVENT TYPE: Onsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2 or 3 or 4)

1. Any of the following valid radiation monitor readings for the refuel floor area, fuel handling area, and the fuel bridge area:
   - ARM HI RAD alarm for the Refueling Floor North End, Refueling Floor South End, New Fuel Storage Area, or Spent Fuel Storage Area
   - Refueling Floor North End, Refueling Floor South End, or New Fuel Storage Area ARM Reading above 10 mR/hr
   - Spent Fuel Storage Area ARM Reading above 100 mR/hr
2. Report of Visual observation of irradiated fuel uncovered.
3. Water level reading below 450” as indicated on LI4541 (floodup) for the Reactor Refueling Cavity that will result in Irradiated Fuel becoming uncovered or valid field report to Control Room of same.
4. Valid Spent Fuel Pool water level indication (LI-3413) below 16 feet Water Level that will result in Irradiated Fuel being uncovering or valid field report to Control Room of same.

DAEC EAL INFORMATION:

Valid means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results. Valid alarms are solely due to damage to irradiated fuel or loss of water level that has or will result in the uncovering of irradiated fuel.

There are no significant deviations from the generic EALs. Increased radiation levels can be detected by the local radiation monitors, in-plant radiological surveys, new fuel and spent fuel storage area radiation monitor alarms displayed on panel 1C04B, fuel pool ventilation exhaust monitors, and by Standby Gas Treatment (SBGT) System automatic start. Applicable area radiation monitors include RT 9163, RT 9164, RT 9153, and RT 9178.

These monitors are located in the north end of the refuel floor, the south end of the refuel floor, the new fuel vault area, and near the spent fuel pool, respectively.

Per ARP 1C04B, the applicable area radiation monitor alarms actuate when radiation levels increase above 100 mR/hr in the spent fuel pool area or above 10 mR/hr in the other three areas of concern. If a valid actuation of these alarms were to occur, the refueling floor would be immediately evacuated. Thus, a report of a fuel handling accident with either valid actuation of the fuel area alarms on panel 1C04B or with measured radiation levels in the spent fuel pool or north fuel area are used to address the generic concern consistent with DAEC design and procedures.

During preparation for reactor cavity flood up prior to entry into refuel mode, reactor vessel level instrument LI-4541 (WR GEMAC, FLOODUP) on control room panel 1C04 is placed in service by I&C personnel connecting a compensating air signal after the reference leg is disconnected from the reactor head. Normal refuel water level is above the top of the span of this flood up level indicator. A valid on-scale indication (*e.g.*, not due to loss of compensating air signal or other instrument channel failure) from this instrument can be used to determine uncontrolled loss of water level in the reactor cavity.

During refueling, the gates between the reactor cavity and the refueling cavity are removed and the spent fuel pool level indicator LI 3413 is used to monitor refueling water level. This measures the common water level in the reactor cavity and the fuel pool. The bottom of the fuel transfer slot between the spent fuel pool and the reactor cavity is 16 feet above the bottom of the spent fuel pool. The top of the active fuel in the spent fuel storage racks is slightly less than 13 feet 9 inches above the bottom of the spent fuel pool. Therefore, postulated failures which drain the reactor cavity through the reactor vessel cannot uncover fuel in the spent fuel storage racks. However, valid indication of spent fuel pool level less than 16 feet would indicate that spent fuel in the storage racks may potentially become uncovered.

RFP404 requires that upon a loss of water level situation, that the refueling crew on the refueling floor shall discharge any fuel assembly on the fuel grapple as follows:

- If a fuel assembly is currently being withdrawn from a slot in the core or spent fuel pool, immediately reinsert it into that slot.
- If a fuel assembly is being transferred and is still over or near the core, insert it into the closest available slot in the core.
- If a fuel assembly is being transferred and is over or near the spent fuel pool, insert it into the closest available slot in the spent fuel racks.

Following these actions, the refueling floor is to be evacuated of all personnel. The DAEC EAL is written to address the generic concern that a spent fuel assembly was not fully

covered by water. This can either be by visual observation of an uncovered spent fuel assembly or by trending fuel pool level in the control room if a spent fuel assembly could not be placed in a safe storage location specified by F&RCHP 5 as described above.

REFERENCES:

1. Alarm Response Procedure (ARP) 1C04B, Reactor Water Cleanup and Isolation
2. Technical Specification 3.7.8, Spent Fuel Pool Water Level
3. Emergency Operating Procedures (EOP) Basis Document, Breakpoints for RC/L & L
4. Emergency Plan Implementing Procedure (EPIP) 3.1, Inplant Radiological Monitoring, Attachment 1, ARM Locations
5. Surveillance Test Procedure (STP) 3.0.0.0-01, Daily and Shift Instrument Checks
6. Integrated Plant Operating Instruction (IPOI) 8 , Outage and Refueling Operations
7. Fuel & Reactor Component Handling Procedure RFP404, Procedure for Moving Core Components Between Reactor Core and Spent Fuel Pool, Within the Reactor Core, or Within the Spent Fuel Pool
8. Bechtel Drawing C-492, Reactor Building - Reactor Well, Spent Fuel & Dryer-Separator Pool General Arrangement, Rev. 6
9. Bechtel Drawing C-493, Reactor Building - Spent Fuel Liner Plan Elevations and Details, Sheet 1, Rev. 6
10. Holtec International Drawing No. 1045, Rack Construction - Spent Fuel Storage Racks, Rev. 3
11. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

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 to Maintain Cold Shutdown

EVENT TYPE: Onsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2)

1. Valid area rad monitor (RE9162) reading GREATER THAN 15 mR/hr in the Control Room.

2. Valid area rad monitor (RE9168) "North CRD Module" reading GREATER THAN 500 mR/hr at the Remote Shutdown Panel, 1C388.

DAEC EAL INFORMATION:

Valid means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results.

There are no significant deviations from the generic EALs. Per the UFSAR, the control room is the only area that is required to be continuously occupied to achieve and maintain safe shutdown following design basis accidents. The capability exists for plant shutdown from outside the main control room in the event that the control room becomes uninhabitable using remote shutdown panel 1C388. The RB 757 CRD North ARM-9168 is in the vicinity of the Remote Shutdown Panel and is used to monitor radiation levels to determine habitability for that area.

The EC/OSS should determine the cause of the increase in radiation levels and review other EALs for applicability. Expected increases in monitor readings due to controlled evolutions (such as lifting the steam dryer during refueling) do not result in emergency declaration. Nor should momentary increases due to events such as resin transfers or controlled movement of radioactive sources result in emergency declaration. In-plant radiation level increases that would result in emergency declaration, are also *unplanned*, e.g., outside the limits established by an existing radioactive discharge permit.

REFERENCES:

1. Alarm Response Procedure (ARP) 1C04B, Reactor Water Cleanup and Isolation
2. Abnormal Operating Procedure (AOP) 913, Fire
3. Abnormal Operating Procedure (AOP) 914, Security
4. Abnormal Operating Procedure (AOP) 915, Shutdown Outside Control Room
5. Surveillance Test Procedure (STP) 3.0.0.0-01, Daily and Shift Instrument Checks
6. Integrated Plant Operating Instruction (IPOI) 8 , Outage and Refueling Operations
7. Emergency Plan Implementing Procedure (EPIP) 3.1, Inplant Radiological Monitoring
8. UFSAR Section 6.4, Habitability Systems
9. Bechtel Calculation DA-4, Project Number 265-002, Control Room Habitability, 9/3/80
10. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

AS1 Site Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mrem TEDE or 500 mrem CDE Thyroid for the Actual or Projected Duration of the Release

EVENT TYPE: Offsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2 or 3)

1. A valid radiation monitor reading which corresponds to an offsite dose of 100 mrem or 500 mrem Thyroid as indicated by the following:

   Reactor Building or Turbine Building ventilation (Kaman) rad monitor reading above 6 E-2 μCi/cc for more than 15 minutes. (Dose assessment not available)

   OR

   Offgas Stack (Kaman) rad monitor reading above 4 E+1 μCi/cc for more than 15 minutes. (Dose assessment not available)

2. Valid MIDAS dose assessment projection indicates dose consequences greater than 100 mrem TEDE or 500 mrem CDE thyroid.

3. Field survey results indicate site boundary dose rates exceeding 100 mrem/hr expected to continue for more than one hour; or analyses of field survey samples indicate CDE thyroid of 500 mrem for one hour of inhalation.

DAEC EAL INFORMATION:

Valid means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results. In a case where data from Kaman readings is being used to determine whether an EAL threshold value has been exceeded, *Valid* means that flow through the associated Kaman Monitor has been verified and does exist as indicated in uCi/sec on SPRAD.

The preferred method for declaration of AS1 is by means of Dose Assessment using the MIDAS computer model. However, if Kaman monitor readings are sustained for longer than 15 minutes and the required MIDAS dose assessments cannot be completed within this period, then the declaration can be made using Kaman readings PROVIDED the readings

are not from an isolated flow path. If Kaman readings are not valid, field survey results may be utilized.

DAEC's Meteorological Information and Dose Assessment System (MIDAS) was utilized to determine the KAMAN monitor limits. Eight separate combinations of release point, source term, meteorological conditions and equipment status were analyzed. Pathways considered were the offgas stack, the turbine building exhaust vent and a single reactor building exhaust vent. Multiple release points were not considered. In this same vein, it was assumed that only one of the three reactor building vents is on during the release.

The source terms used have been pre-loaded into MIDAS and are the default mixes associated with a loss of coolant accident (LOCA) and a control rod drop (CRD). The LOCA mix was used in conjunction with a release via the offgas stack while the CRD mix was used for releases via the turbine or reactor building vents. The source term for a release via the offgas stack is further impacted by the status of the standby gas treatment system. The status of that system was also taken into consideration.

Based on 1995 data (NG-96-0987), the atmospheric stability was classified as Pascal E 33% of the time. Consequently, both classifications were evaluated. Based on the same report, the most common wind speeds were:

Pascal Class	Altitude	Speed (mph)
D	156'	8 - 12
D	33'	8 - 12
E	156'	8 - 12
E	33'	4 - 7

Though the temperature setting has no impact on the MIDAS calculations, a value must be entered in order for the program to run. Consequently, the temperature was arbitrarily set at 50 F.

The rain estimate was set at zero, to eliminate any on site washout of radioactive material.

For the first MIDAS runs a 1Ci/cc concentration was assumed. The results of these runs were then normalized to the limits, thus generating a theoretical KAMAN limit. Additional MIDAS runs were made with these theoretical limits as input to verify the normalization process.In addition to the total integrated dose, MIDAS calculates a peak whole body DDE rate resulting from the plume and a peak thyroid CDE rate resulting from inhalation. Because the AS1 and AG1 KAMAN limits are to be based on a one hour exposure, establishing concentration limits so these peak values match the NUMARC limits is acceptable.

Initiating Condition	Site Area Emergency AS1	General Emergency AG1
Valid Turbine or Reactor Building ventilation rad monitor (KAMAN) reading for more than 15 minutes above:	0.06 μCi/cc	0.6 μCi/cc

DAEC does not have a telemetered radiation monitoring system. As an alternative, DAEC uses valid field survey readings outside the site boundary to determine if doses are greater than 100 mR/hr TEDE or greater than 500 mR/hr CDE Thyroid.

Dose assessment using MIDAS is based on the EPA-400 methodology, *e.g.*, use of Total Effective Dose Equivalent (TEDE) and Committed Dose Equivalent (CDE) Thyroid. TEDE is somewhat different from whole body dose from gaseous effluents determined by ODAM methodology which forms the basis for the radiation monitor readings calculated in AU1. These factors can introduce differences that are at least as large as those introduced by using TEDE versus whole body dose. The gaseous effluent radiation monitors can only detect noble gases. The contribution of iodine's to TEDE and CDE Thyroid could therefore only be determined either by: (1) utilizing the source term mixture in MIDAS, or (2) gaseous effluent sampling. Therefore, DAEC EAL Threshold Value 4 is written in terms of TEDE and CDE Thyroid.

REFERENCES:

1. Offsite Dose Assessment Manual, Section 6.1.2 and 7.1.2, Bases
2. Emergency Plan Implementing Procedure (EPIP) 3.3, Dose Assessment and Protective Action
3. Radiation Protection Calculation No. 95-001-C, Emergency Actions Levels Based on Effluent Radiation Monitors, January 24, 1995
4. Radiation Engineering Calculation No. 96-007-A, Determination of DAEC Radioactive Release Initiating Conditions for AS1 & AG1 Emergency Classifications, July 3, 1996
5. UFSAR Section 11.5, Process and Effluent Radiation Monitoring and Sampling Systems
6. EPA 400-R-92-001, *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*
7. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999

AG1 Site Boundary Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity that Exceeds 1,000 mrem TEDE or 5,000 mrem CDE Thyroid for the Actual or Projected Duration of the Release

EVENT TYPE: Offsite Rad Conditions

OPERATING MODE APPLICABILITY: All

EAL THRESHOLD VALUE: (1 or 2 or 3)

1. A valid radiation monitor reading which corresponds to an offsite dose of 1000 mrem or 5000 mrem Thyroid as indicated by the following:

   Reactor Building or Turbine Building ventilation (Kaman) rad monitor reading above 6 E-1 μCi/cc for more than 15 minutes. (Dose assessment not available)

   OR

   Offgas Stack (Kaman) rad monitor reading above 4 E+2 μCi/cc for more than 15 minutes. (Dose assessment not available)

2. Valid MIDAS dose assessment projection indicates dose consequences greater than 1,000 mrem TEDE or 5,000 mrem CDE thyroid.

3. Field survey results indicate site boundary dose rates exceeding 1,000 mrem/hr expected to continue for more than one hour; or analyses of field survey samples indicate CDE thyroid of 5,000 mrem for one hour of inhalation.

DAEC EAL INFORMATION:

Valid means that the reading is from instrumentation determined to be operable in accordance with the Technical Specifications or has been verified by other independent methods such as indications displayed on the control panels, reports from plant personnel, or radiological survey results. In a case where data from Kaman readings is being used to determine whether an EAL threshold value has been exceeded, *Valid* means that flow through the associated Kaman Monitor has been verified and does exist as indicated in uCi/sec on SPRAD.

The preferred method for declaration of AG1 is by means of Dose Assessment using the MIDAS computer model. However, if Kaman monitor readings are sustained for longer than 15 minutes and the required MIDAS dose assessments cannot be completed within this period, then the declaration can be made using Kaman readings PROVIDED the readings are not from an isolated flow path. If Kaman readings are not valid, field survey results may be utilized.

DAEC's Meteorological Information and Dose Assessment System (MIDAS) was utilized to determine the KAMAN monitor limits. Eight separate combinations of release point, source term, meteorological conditions and equipment status were analyzed. Pathways considered were the offgas stack, the turbine building exhaust vent and a single reactor building exhaust vent. Multiple release points were not considered. In this same vein, it was assumed that only one of the three reactor building vents is on during the release.

The source terms used have been pre-loaded into MIDAS and are the default mixes associated with a loss of coolant accident (LOCA) and a control rod drop (CRD). The LOCA mix was used in conjunction with a release via the offgas stack while the CRD mix was used for releases via the turbine or reactor building vents. The source term for a release via the offgas stack is further impacted by the status of the standby gas treatment system. The status of that system was also taken into consideration.

Based of 1995 data (NG-96-0987), the atmospheric stability was classified as Pascal E 33% of the time. Consequently, both classifications were evaluated.[1] Based on the same report, the most common wind speeds were:

Pascal Class	Altitude	Speed (mph)
D	156'	8 - 12
D	33'	8 - 12
E	156'	8 - 12
E	33'	4 - 7

Though the temperature setting has no impact on the MIDAS calculations, a value must be entered in order for the program to run. Consequently, the temperature was arbitrarily set at 50 F.

The rain estimate was set at zero, to eliminate any on site washout of radioactive material.

For the first MIDAS runs a 1Ci/cc concentration was assumed. The results of these runs were then normalized to the limits, thus generating a theoretical KAMAN limit. Additional MIDAS runs were made with these theoretical limits as input to verify the normalization process.

In addition to the total integrated dose, MIDAS calculates a peak whole body DDE rate resulting from the plume and a peak thyroid CDE rate resulting from inhalation. Because the AS1 and AG1 KAMAN limits are to be based on a one hour exposure, establishing concentration limits so these peak values match the NUMARC limits is acceptable.

Initiating Condition	Site Area Emergency AS1	General Emergency AG1
Valid Turbine or RB ventilation rad monitor (KAMAN) reading for more than 15 minutes above:	0.06 μCi/cc	0.6 μCi/cc
Valid Offgas Stack ventilation rad monitor (KAMAN) reading for more than 15 minutes above:	40 μCi/cc	400 μCi/cc

DAEC does not have a telemetered radiation monitoring system. As an alternative, DAEC uses valid field survey readings outside the site boundary to determine if doses are greater than 1,000 mR/hr TEDE or greater than 5,000 mR/hr CDE to the Thyroid.

Dose assessment using MIDAS is based on the EPA-400 methodology, *e.g.*, use of Total Effective Dose Equivalent (TEDE) and Committed Dose Equivalent (CDE) Thyroid. TEDE is somewhat different from whole body dose from gaseous effluents determined by ODAM methodology which forms the basis for the radiation monitor readings calculated in AU1. These factors can introduce differences that are at least as large as those introduced by using TEDE versus whole body dose. The gaseous effluent radiation monitors can only detect noble gases. The contribution of iodine's to TEDE and CDE Thyroid could therefore only be determined either by: (1) utlizing the source term mixture in MIDAS, or (2) gaseous effluent sampling. Therefore, DAEC EAL Threshold Value 4 is written in terms of TEDE and CDE Thyroid.

REFERENCES:

1. Offsite Dose Assessment Manual, Section 6.1.2 and 7.1.2, Bases
2. Emergency Plan Implementing Procedure (EPIP) 3.3, Dose Assessment and Protective Action
3. Radiation Protection Calculation No. 95-001-C, Emergency Actions Levels Based on Effluent Radiation Monitors, January 24, 1995
4. Radiation Engineering Calculation No. 96-007-A, Determination of DAEC Radioactive Release Initiating Conditions for AS1 & AG1 Emergency Classifications, July 3, 1996
5. UFSAR Section 11.5, Process and Effluent Radiation Monitoring and Sampling Systems
6. EPA 400-R-92-001, *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*
7. *NEI Methodology for Development of Emergency Action Levels NUMARC/NESP-007 Revision 4*, May 1999.