Facility: Fort Calhoun Station	Date of Examination: April 16, 2012
Examination Level: RO	Operating Test Number: 2012-01

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
RA1: Conduct of Operations	N, R	Calculate the estimated critical boron concentration for a reactor startup (Per TDB-II worksheet and curves) K/A 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc (CFR: 41.10, 45.12) RO IR: 3.9
RA2: Conduct of Operations	N, R	Performa a Quadrant Power Tilt Calculation with Excore detectors operable and ERF inoperable per OI-NI-1 K/A 2.1.20 Ability to interpret and execute procedure steps (CFR: 41.10, 45.12) RO IR: 4.6
RA3: Equipment Control	N, R	Prepare a manual clearance for maintenance on component cooling water pump AC-3C. K/A 2.2.13 Knowledge of tagging and clearance procedures (CFR: 41.10, 45.13) RO IR: 4.1
RA4: Radiation Control	N, R	Determine whether to install shielding based on given dose rates and work times. K/A 2.3.12 Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 45.9, 45.10) RO IR: 3.2
Emergency Procedures/Plan		N/A

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.

* Type Codes & Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

Facility: Fort Calhoun Station Date of Examination: April 16, 2012
Examination Level: SRO Operating Test Number: 2012-01

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
SA1: Conduct of Operations	N, R	Calculate amount of water and boric acid required to raise SIRWT level ten inches and maintain current SIRWT boric acid concentration. K/A 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 43.5, 45.12) SRO IR: 4.2
SA2: Conduct of Operations (same as RA2)	N, R	Perform a Quadrant Power Tilt Calculation with Excore detectors operable and ERF inoperable per OI-NI-1 K/A 2.1.20 Ability to interpret and execute procedure steps (CFR: 43.5, 45.12) SRO IR: 4.6
SA3: Equipment Control	N, R	Review manual clearance for maintenance on component cooling water pump AC-3C. K/A 2.2.13 Knowledge of tagging and clearance procedures (CFR: 45.13) SRO IR: 4.3
SA4: Radiation Control	N, R	Determine whether to install shielding based on given dose rates and work times. K/A 2.3.12 Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 45.9, 45.10) SRO IR: 3.7
SA5: Emergency Procedures/Plan	N, R	Determine Emergency Action Level for a given emergency. K/A 2.4.38 Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required. (CFR: 43.5, 45.11) SRO IR: 4.4

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.

* Type Codes & Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

Facility: Fort Calhoun Station Exam Level: RO		Date of Examination: April 16, 2012 Operating Test No.: 2012-01
Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
S-1: Swap pressurizer pressure mode from manual to automatic, followed by spurious actuation of PORV (block valve initially fails to close)	N, A, S	3
S-2: Engineered Safeguards Actuation Verification (A PPLS relay fails to actuate, requiring manual initiation of PPLS, and HPSI injection valves fail to open, requiring control room action to open)	N, EN, A, S	2
S-3: Place a containment cooling unit in service (VA-8A/VA-7C)	D, S	5
S-4: Place shutdown cooling in service per OI-SC-1, Att. 1	N, L, S	4P
S-5: Maintain S/G water levels during startup using AFW. (Loss of AFW, have to start a main feedwater pump to restore flow)	N, A, L, S	4S
S-6: Valve stroke time testing of containment pressure relief valve HCV-246B	N, S	8
S-7: Dilute to achieve desired boron concentration for desired critical rod height (an unexpected reactivity increase occurs, requiring securing of dilution)	N, A, L, S	1
S-8: Transfer non-vital buses 1A1 and 1A2 onto 345kV bus per AOP-32	N, S	6
In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
P-1: Respond to a steam bound AFW pump FW-6 (MDAFW pump)	D, E	4S
P-2: Rack down a non-remote equipped 4160V circuit breaker	N	6
P-3: Waste gas transfer from the vent header to the gas decay tank	D, A, R	9

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U

(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	- / - / ≥1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Facility: Fort Calhoun Station
Exam Level: SRO-I

Date of Examination: April 16, 2012
Operating Test No.: 2012-01

Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
S-1: Swap pressurizer pressure mode from manual to automatic, followed by spurious actuation of PORV (block valve initially fails to close)	N, A, S	3
S-2: Engineered Safeguards Actuation Verification (A PPLS relay fails to actuate, requiring manual initiation of PPLS, and HPSI injection valves fail to open, requiring control room action to open)	N, EN, A, S	2
S-3: Place a containment cooling unit in service (VA-8A/VA-7C)	D, S	5
S-5: Maintain S/G water levels during startup using AFW. (Loss of AFW, have to start a main feedwater pump to restore flow)	N, A, L, S	4S
S-6: Valve stroke time testing of containment pressure relief valve HCV-246B	N, S	8
S-7: Dilute to achieve desired boron concentration for desired critical rod height (an unexpected reactivity increase occurs, requiring securing of dilution)	N, A, L, S	1
S-8: Transfer non-vital buses 1A1 and 1A2 onto 345kV bus per AOP-32	N, S	6

In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

P-1: Respond to a steam bound AFW pump FW-6 (MDAFW pump)	D, E	4S
P-2: Rack down a non-remote equipped 4160V circuit breaker	N	6
P-3: Waste gas transfer from the vent header to the gas decay tank	D, A, R	9

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U

(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	- / - / ≥1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Facility: Fort Calhoun Station	Date of Examination: April 16, 2012
Exam Level: SRO-U	Operating Test No.: 2012-01

Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
S-1: Swap pressurizer pressure mode from manual to automatic, followed by spurious actuation of PORV (block valve initially fails to close)	N, A, S	3
S-2: Engineered Safeguards Actuation Verification (A PPLS relay fails to actuate, requiring manual initiation of PPLS, and HPSI injection valves fail to open, requiring control room action to open)	N, EN, A, S	2
S-7: Dilute to achieve desired boron concentration for desired critical rod height (an unexpected reactivity increase occurs, requiring securing of dilution)	N, A, L, S	1

In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

P-1: Respond to a steam bound AFW pump FW-6 (MDAFW pump)	D, E	4S
P-3: Waste gas transfer from the vent header to the gas decay tank	D, A, R	9

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	- / - / ≥1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

JPM No: RA1 Rev 3

JPM Title: Estimated Critical Condition Calculation

Location: Classroom

Approximate Time: 30 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 2.1.25
Ability to interpret reference materials, such as graphs, curves, tables, etc.
Procedures: TDB-V-1-B, "Estimated Critical Conditions Worksheet, Rev 23, TDB-II, "Reactivity Curves", Rev 32

Handout(s): TDB-V-1-B

Task List#: 1528

Applicable Position(s): RO/SRO

Time Critical: No

Alternate Path: No

JPM Prepared by: Jerry Koske Date: 3/22/12

JPM No: RA1 Rev 3

JPM Title: Estimated Critical Condition Calculation

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment: Calculator

Safety Considerations:

Comments:

JPM No: RA1 Rev 3

JPM Title: Estimated Critical Condition Calculation

TASK STANDARD: **The Applicant calculated the estimated critical boron concentration for a reactor startup using the given conditions, the Estimated Critical Conditions Worksheet and the Reactivity Curves in TDB-II. The estimated critical boron concentration was determined to be approximately 1000 ppm (950 – 1050 ppm)**

INITIAL CONDITIONS:

- **The plant is shutdown as the result of a reactor trip and a reactor startup is scheduled at 0900 on 4/15/12.**
- **Shutdown from 100% power occurred at 2000 on 4/13/12**
- **The plant was operating with all rods out prior to the trip**
- **Boron concentration prior to the trip was 638 ppm**
- **Average core burnup is 6,000 MWD/MTU**
- **The Reactor Engineer has specified a desired CEA position for criticality, group 4 at 85 inches**
- **Boron concentration was increased to 750 ppm to ensure adequate shutdown margin**
- **DEN-Nuclear states that no correction is needed for boron depletion**

INITIATING CUE: **You are directed to determine the estimated critical boron concentration for this startup.**
Another Operator will determine the amount of Water or Acid needed to change the boron concentration.

JPM No: RA1 Rev 3

JPM Title: Estimated Critical Condition Calculation

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1	Obtains TDB-V.1.B, “Estimated Critical Conditions Worksheet” from the Technical Data Book.	Located TDB-V.1.B [SAT] [UNSAT] **NOTE: Provide procedure copy after it is located in TDB.**
2 (A.1)	Records the following: Shutdown date and time	Recorded 4/13/12 @ 2000 [SAT] [UNSAT]
3 (A.2)	Reactor power before shutdown	Recorded 100% [SAT] [UNSAT]
4 (A.3)	CEA positions before time of shutdown	Recorded 126” for all groups [SAT] [UNSAT]
5 (A.4)	Reactor Coolant System boron concentration before shutdown.	Recorded 638 ppm [SAT] [UNSAT]
6 (A.5)	Core average burnup	Recorded 6000 MWD/MTU [SAT] [UNSAT]
7 (B.1)	Startup date and time	Recorded 4/15/12 @ 0900 [SAT] [UNSAT]
8 (B.2)	Time interval between shutdown and startup	Calculated and recorded 37 hours [SAT] [UNSAT]

JPM No: RA1 Rev 3

JPM Title: Estimated Critical Condition Calculation

STEP	ELEMENT	STANDARD
9 (B.3)	Desired CEA positions at time of startup. (Manual Sequential Mode)	Recorded 85” for group 4 and 126” for all other groups [SAT] [UNSAT]
10 (B.4)	Present Reactor Coolant System boron concentration	Recorded 750 ppm [SAT] [UNSAT]
11 (C.1)	Reactivity change due to change in power: Using TDB Figure II.C.2.a or II.C.2.b, the power level from A.2, and the Average Core Burnup from A.5, record the power defect added due to the shutdown.	Used one of the selected figures. Recorded approximately 1.60-1.71 depending on figure used. [SAT] [UNSAT]
12 (C.2)	Reactivity change due to control rod position change:	Used one of the selected figures. Calculated and recorded approximately -0.17 to -0.19 (C.2.c) depending on figure used. [SAT] [UNSAT]
13 (C.3)	Reactivity change due to changes in Xenon Concentrations.	Used the referenced figures. Recorded approximately 1.50% delta rho [SAT] [UNSAT]
14 (C.4)	Reactivity change due to change in boron concentration.	Used the referenced figures. Calculated and recorded approximately -0.94% delta rho [SAT] [UNSAT]

JPM No: RA1 Rev 3

JPM Title: Estimated Critical Condition Calculation

STEP	ELEMENT	STANDARD
15 (C.5)	Sum of reactivity changes:	Entered values, calculated and entered approximately 2.097 (1.7-2.5) % delta rho (C.5.e) [SAT] [UNSAT]
16 (D.1)	Find and record inverse boron worth using TDB Figure II.A.4 at HZP and the burnup A.5 above.	Used figure to determine inverse boron worth to be approximately 119.5 ppm/% delta rho [SAT] [UNSAT]
17 (D.2)	Find the change in boron concentration by multiplying C.5.e by D.1. (Be sure to transcribe the algebraic sign of C.5.e.)	Calculated and recorded approximately 250 ppm (200-300 ppm) in space D.2 [SAT] [UNSAT]
**18 (D.3)	Find the estimated boron concentration.	Calculated and recorded approximately 1000 ppm (950-1050 ppm) in space D.3.d [SAT] [UNSAT]

Termination Criteria: Applicant has determined Estimated Critical boron concentration.

JPM No:

INITIAL CONDITIONS:

- **The plant is shutdown as the result of a reactor trip and a reactor startup is scheduled at 0900 on 4/15/12.**
- **Shutdown from 100% power occurred at 2000 on 4/13/12**
- **The plant was operating with all rods out prior to the trip**
- **Boron concentration prior to the trip was 638 ppm**
- **Average core burnup is 6,000 MWD/MTU**
- **The Reactor Engineer has specified a desired CEA position for criticality, group 4 at 85 inches**
- **Boron concentration was increased to 750 ppm to ensure adequate shutdown margin**
- **DEN-Nuclear states that no correction is needed for boron depletion**

INITIATING CUE: **You are directed to determine the estimated critical boron concentration for this startup.**
Another Operator will determine the amount of Water or Acid needed to change the boron concentration.

Name: ____

Estimated critical boron concentration:_____________ ppm

KEY

Fort Calhoun Station
Unit 1

TDB-V.1.B

TECHNICAL DATA BOOK

ESTIMATED CRITICAL CONDITIONS WORKSHEET

Change No.	EC 48088
Reason for Change	Separated procedure into two parts to allow for calculation of estimated critical conditions after mid-cycle or refueling shutdown.
Requestor	Tim Bussey
Preparer	Ron Shirley
Issue Date	12-15-09 1645

ESTIMATED CRITICAL CONDITION WORKSHEET

Part I - Performed after a mid-cycle shutdown where Xenon may be present.

2012-002
Criticality No.

4/15/12
Date

KEY

A. Conditions at Time of Shutdown

A.1. Shutdown date and time. 4/13/12 (DATE) 2000 (TIME)

A.2. Reactor power before shutdown. 100 %

A.3. CEA Positions before time of shutdown.

Group 1 126 inches

Group 2 126 inches

Group 3 126 inches

Group 4 126 inches

Group N 126 inches

A.4. Reactor Coolant System boron concentration before shutdown. 638 PPM

A.5. Core average burnup. 6000 MWD/MTU

B. Conditions at Time of Startup

B.1. Startup date and time. 4/15/12 (DATE) 0900 (TIME)

B.2. Time interval between shutdown and startup. 37 hours

B.3. Desired CEA positions at time of startup. (Manual Sequential Mode)

Group 1 126 inches

Group 2 126 inches

Group 3 126 inches

(1) Group 4 85 inches

Group N 126 inches

(1) Normally 85 inches or as specified by the Reactor Engineer.

B.4. Present Reactor Coolant System boron concentration. 750 PPM

C. <u>Reactivity Changes Due to Shutdown</u>

NOTE: Due to transient conditions which may not have been assumed in the generation of TDB figures, the Reactor Engineer may request DEN to provide present condition data. This data will be generated with approved computer codes and may be entered in place of TDB figure data. Such entries shall be annotated.

NOTE: When using TDB figures to obtain reactivity values, enter absolute values (no signs). When performing calculations with reactivity values the answer will be in the proper sign. Record calculated value with sign.

C.1. Reactivity change due to change in power:

Using TDB Figure II.C.2.a or II.C.2.b, the power level from A.2, and the Average Core Burnup from A.5, record the power defect added due to the shutdown.

1.707 %Δρ
C.1

KEY

C.2. Reactivity change due to control rod position change:

NOTE: The applicable TDB Figures II.B.2 or II.B.3 can be used, but the same figure must be used in both Steps C.2.a. and C.2.b.

C.2.a. Reactivity change due to rod insertion:

Using the applicable TDB Figure, the CEA positions from A.3, and the Average Core Burnup from A.5, record the reactivity contribution due to inserting all regulating rods.

3.27 %Δρ
C.2.a

C.2.b. Reactivity change due to rod withdrawal:

Using the applicable TDB Figure, the CEA positions from B.3, and the Average Core Burnup from A.5, record the reactivity contribution due to withdrawal of CEA's to startup positions.

3.10 %Δρ
C.2.b

C.2.c. Calculate the net reactivity change due to net control rod position change. Subtract C.2.a from C.2.b. Be sure to enter the sign of the difference.

(3.10) - (3.27) = -0.17 %Δρ
C.2.b C.2.a C.2.c

C.3. Reactivity change due to changes in Xenon Concentrations.

NOTE: If equilibrium conditions existed before plant shutdown, TDB Figures II.D.1.a, II.D.1.b or II.D.2 may be used to determine the shutdown Xenon worth.

NOTE: If equilibrium conditions existed before shutdown, and the plant tripped, TDB Figure II.D.2 may be used to determine both shutdown and startup Xenon worth.

NOTE: If the above conditions do not apply, use the conditions of Parts A and B above to determine the reactivity change due to Xenon.

C.3.a. Shutdown Xenon worth 2.55 %Δρ
C.3.a

C.3.b. Startup Xenon worth 1.05 %Δρ
C.3.b

KEY

C.3.c. Calculate the net reactivity change due to Xenon. Subtract C.3.b from C.3.a. Be sure to enter the algebraic sign of the difference.

(2.55) - (1.05) = 1.50 %Δρ
C.3.a C.3.b C.3.c

C.4. Reactivity change due to change in boron concentration.

C.4.a. If there is no change in boron concentration enter 0 on line C.4.e below and proceed to Step C.5.

C.4.b. Enter TDB Figure II.A.4 using the burnup of A.5 above. Record the HZP inverse soluble boron worth.

119.5 ppm/%Δρ
C.4.b

C.4.c. Reactivity due to soluble boron concentration at time of shutdown. Divide boron concentration A.4 by inverse boron worth C.4.b.

(638) / (119.5) = 5.34 %Δρ
A.4 C.4.b C.4.c

C.4.d. Reactivity due to soluble boron concentration at time of startup. Divide present boron concentration B.4 by inverse boron worth C.4.b.

(750) / (119.5) = 6.28 %Δρ
B.4 C.4.b C.4.d

C.4.e. Calculate the net reactivity change due to boron concentration change. Subtract C.4.d from C.4.c above. Enter the algebraic sign of the difference.

(5.34) - (6.28) = -0.94 %Δρ
C.4.c C.4.d C.4.e

C.5. Sum of reactivity changes:

(Find the algebraic sum of items C.1, C.2.c, C.3.c and C.4.e. Be sure to include the algebraic sign.)

C.5.a. Change in reactivity due to change in power. 1.707 %Δρ
C.1

C.5.b. Change in reactivity due to control rod position change.

-0.17 %Δρ
C.2.c

KEY

C.5.c. Change in reactivity due to Xenon Transient. 1.50 %Δρ
C.3.c

C.5.d. Change in reactivity due to change in boron concentration.

-0.94 %Δρ
C.4.e

C.5.e. Total 2.097 %Δρ
C.5.e

D. Estimated Critical Boron Concentration

D.1. Find and record inverse boron worth using TDB Figure II.A.4 at HZP and the burnup A.5 above.

Inverse boron worth = 119.5 ppm/% Δρ
D.1

D.2. Find the change in boron concentration by multiplying C.5.e by D.1. (Be sure to transcribe the algebraic sign of C.5.e.)

2.097 % Δρ X 119.5 ppm/% Δρ = 250 ppm
C.5.e D.1 D.2

D.3. Find the estimated boron concentration.

D.3.a. Present boron concentration 750 ppm
B.4

D.3.b. Change in boron concentration 250 ppm
D.2

D.3.c. If large RCS Volume changes (eg., draining to mid-loop) are made, an adjustment may be needed to compensate for changes in B-10 concentration. Adjustments may be required, depending on various factors such as time in life or the length of the operating cycle between shutdowns. Contact Reactor Performance Analysis for assistance in determining this value.

Ø ppm
D.3.c

KEY

D.3.d. Estimated critical boron concentration (ECB)

= (750) + (250) + (∅) = 1000 ppm
D.3.a D.3.b D.3.c D.3.d

D.4. Calculation of Reactor Coolant system additions required.

D.4.a. Calculate the gallons of water or boric acid required to attain the startup boron concentration using the plant computer following OI-ERFCS-1.

Gallons of water required: ___________

Gallons of boric acid required: _____________

Circle boric acid source: Ch-11A ________% Ch-11B ________%
% boron % boron

E. <u>Minimum and Maximum Critical Rod Position</u>

NOTE: Mark Steps E and F N/A if diluting to critical.

E.1. Determination of critical position CEA worth.

E.1.a. Use data from B.3, C.2.b for desired critical position.

Group 1 ____________ inches

Group 2 ____________ inches

Group 3 ____________ inches

Group 4 ____________ inches

Group N ____________ inches

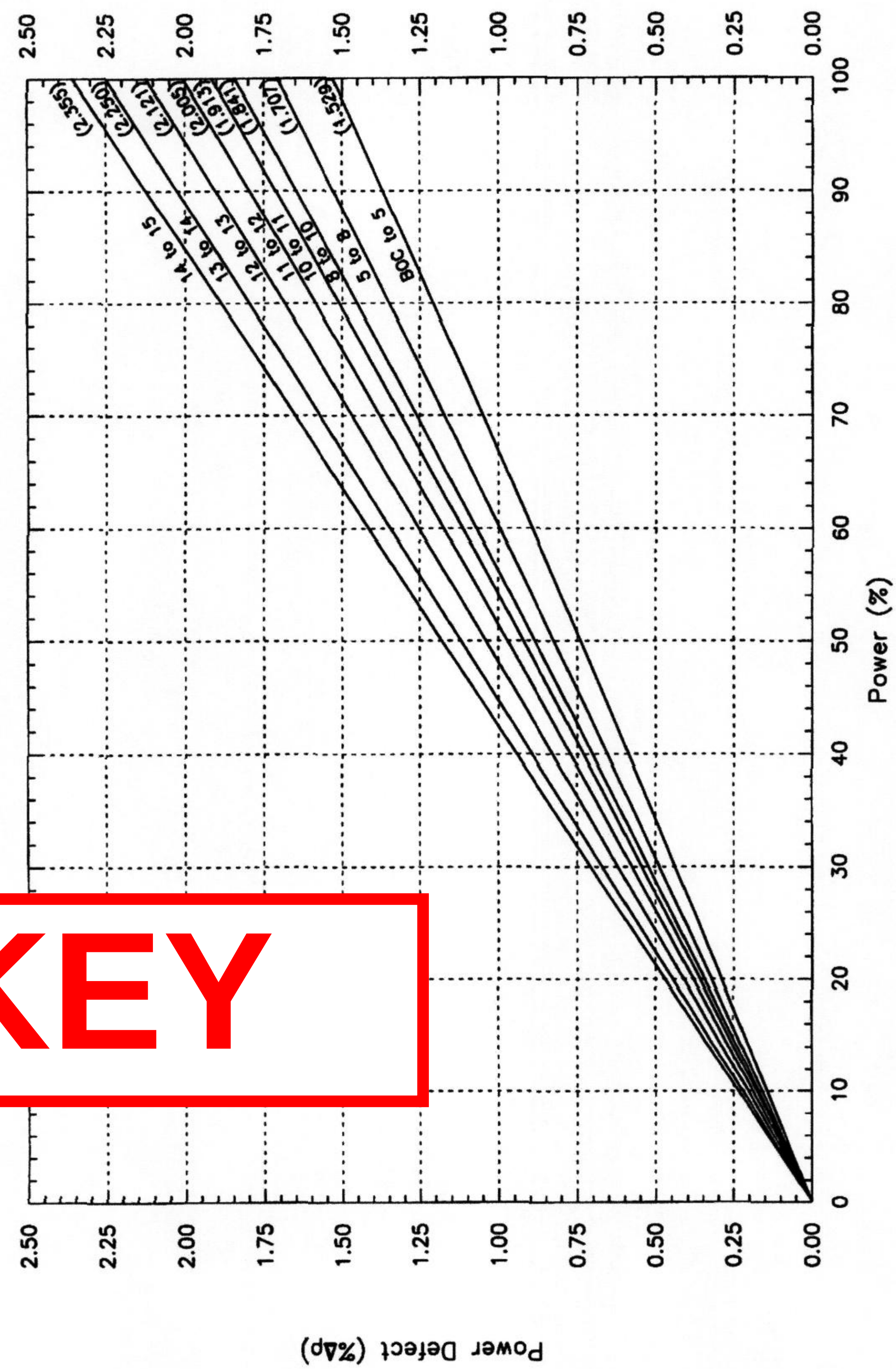
E.1.b. Using desired position from E.1.a, applicable TDB Figure II.B.2 and core average burnup A.5, determine critical position CEA worth.

CEA worth at desired critical position: _____________ $\%\Delta\rho$
E.1.b

E.2. Find the maximum critical CEA position.

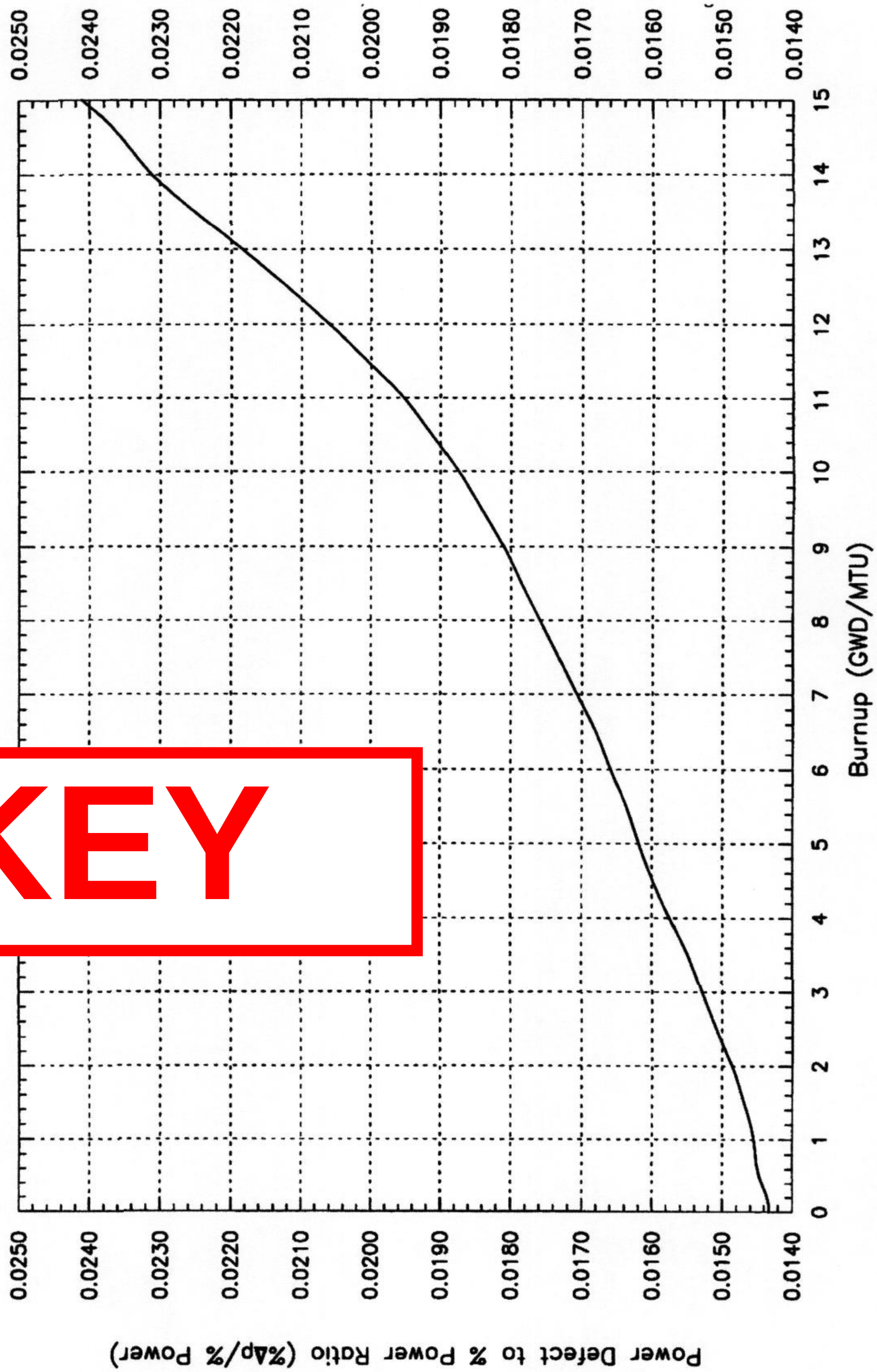
KEY

Figure II.C.2.a - Cycle 27 Total Power Defect vs. Power
(BOC to 15 GWD/MTU)



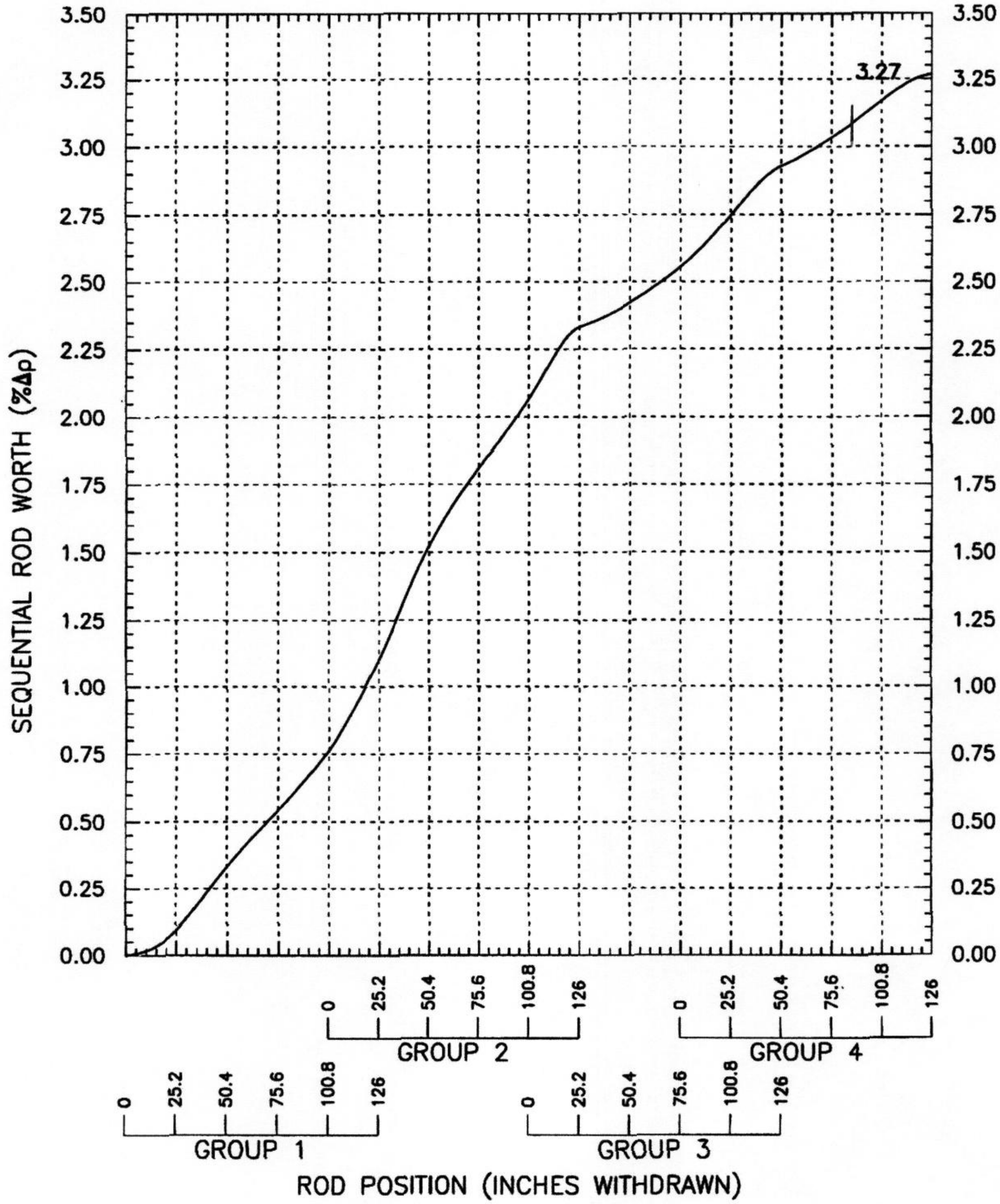
KEY

Figure II.C.2.b - Cycle 27 Total Power Defect to Percent Power Ratio vs. Burnup
(All Power Levels)



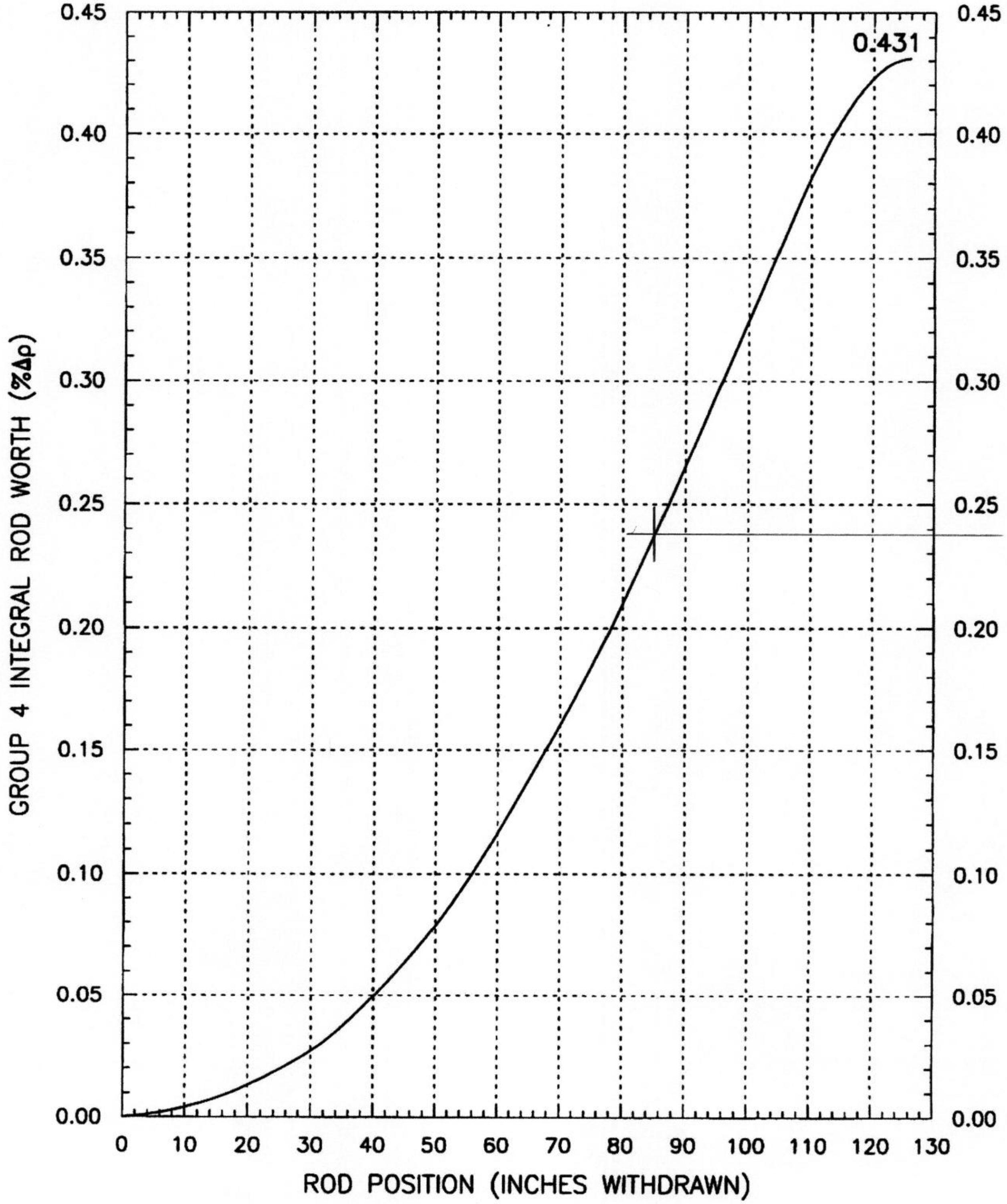
KEY

Figure II.B.2.b - Cycle 27 Sequential Rod Worth vs. Rod Position
(HZP, 5 to 7 GWD/MTU)
GROUPS 1-4



KEY

Figure II.B.3.c - Cycle 27 Group 4 Integral Rod Worth vs. Rod Position
(HZP, 5 to 9 GWD/MTU)



KEY

Figure II.D.1.b - Cycle 27 Equilibrium Xenon Reactivity vs. Burnup
(All Rods Out, HFP)

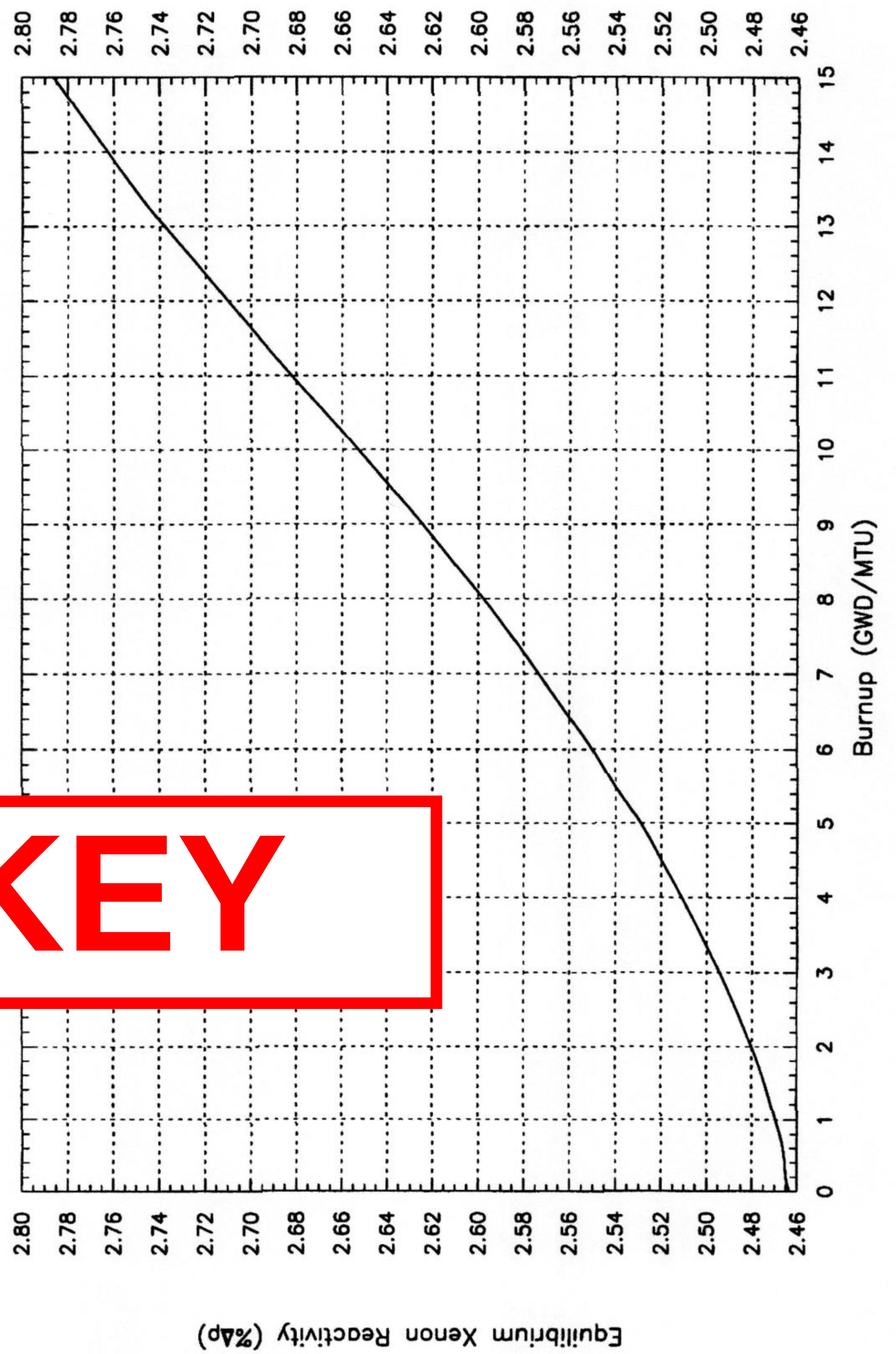


Figure II.D.2.b - Cycle 27 Xenon Reactivity After Trip
(MOC)

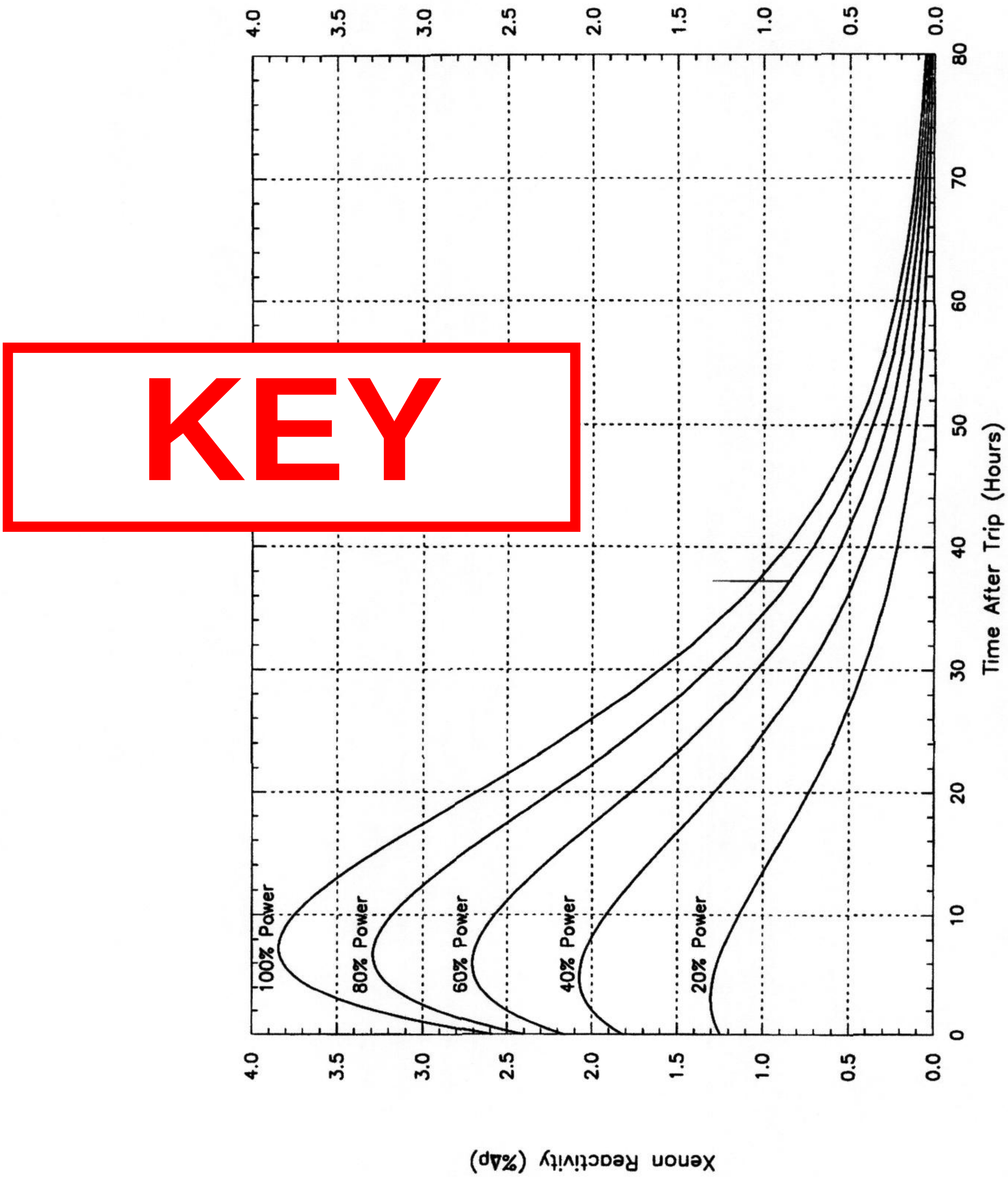
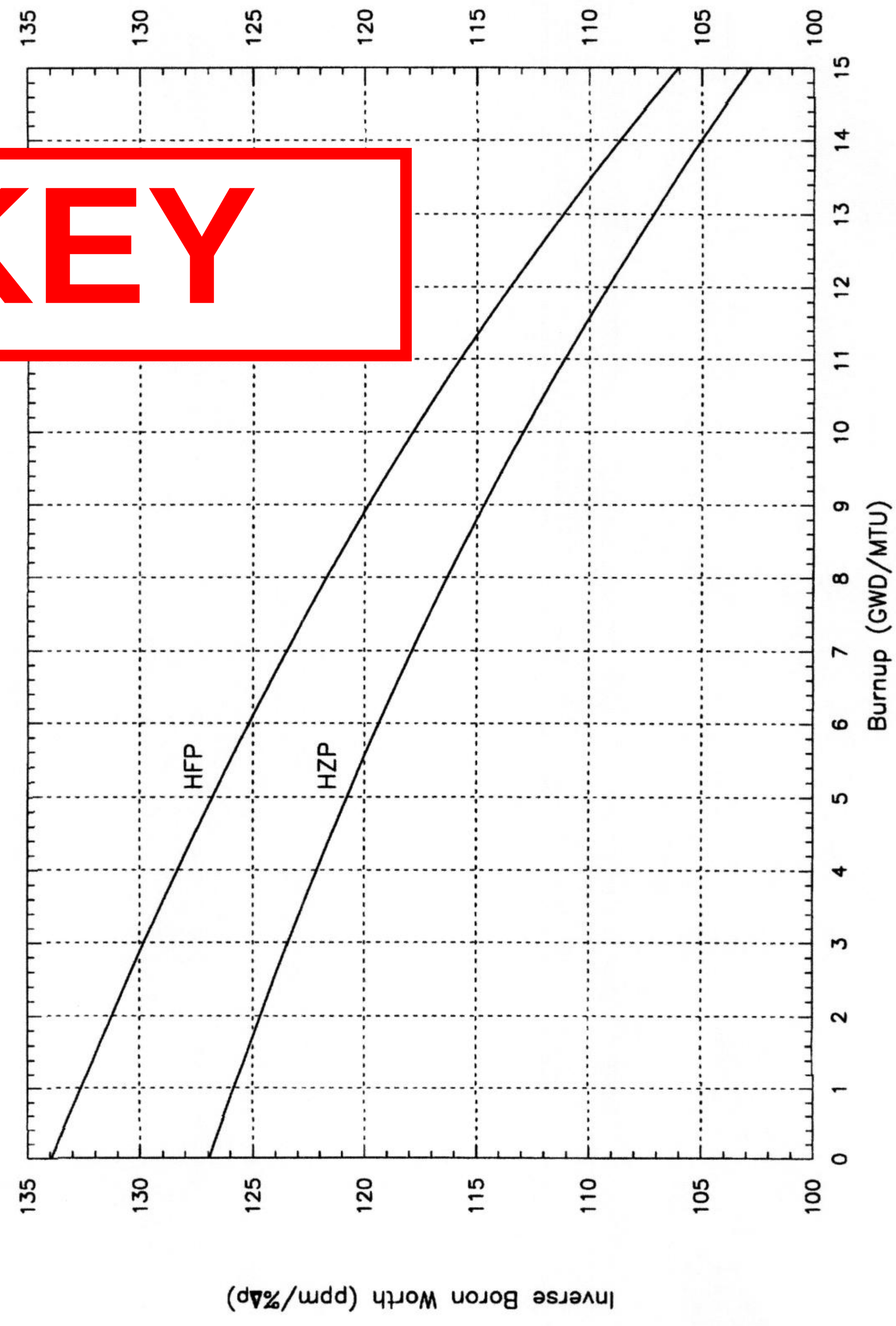


Figure II.A.4 - Cycle 27 Inverse Boron Worth vs. Burnup



JPM No: RA2 and SA2 Rev 3

JPM Title: Perform a Quadrant Power Tilt Calculation

Location: Classroom

Approximate Time: 20 minutes Start Time:_________________

End Time:__________________

Actual Time: _________________

Reference(s): K/A# 2.1.20
Ability to interpret and execute procedure steps.

OI-NI-1, Attachment 4, “Quadrant Power Tilt Calculation,” Rev 22
Form FC-171, “Corrected Excore Azimuthal Power Tilt Limits, Revision 11

Handout(s): Partially completed OI-NI-1, Attachment 4
Filled out Form FC-171

Task List#: 0083

Applicable Position(s): RO/SRO

Time Critical: No

Alternate Path: No

JPM Prepared by: ______________________________ Date: ___________

JPM No: RA2 and SA2 Rev 3

JPM Title: Perform a Quadrant Power Tilt Calculation

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: _____________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment: Calculator

Safety Considerations: None

Comments:

JPM No: RA2 and SA2 Rev 3

JPM Title: Perform a Quadrant Power Tilt Calculation

TASK STANDARD:	**Applicant performed a quadrant power tilt calculation per OI-NI-1 Attachment 4 Step 2. Applicant calculated QPTR to be 0.53% for the upper and 0.90% for the lower. Applicant determined that the calculated lower tilt exceeds the FC-171 value provided.**
INITIAL CONDITIONS:	• **ERF and GARDEL are inoperable.** • **Excore detectors are available.** • **I&C measured and recorded voltage readings for the excore detectors per OI-NI-1, NUCLEAR INSTRUMENTATION SYSTEM, Attachment 4, "Quadrant Power Tilt Calculation", Step 2.a.** **FC-171, CORRECTED EXCORE AZIMUTHAL POWER TILT LIMITS, is attached.**
INITIATING CUE:	**You are directed to perform a quadrant power tilt calculation per OI-NI-1, Attachment 4, Step 2, using the information collected by I&C. Based on your calculations, determine if the indicated upper tilt and indicated lower tilt are within the values given in FC-171.**

JPM No: RA2 and SA2 Rev 3

JPM Title: Perform a Quadrant Power Tilt Calculation

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
**1 (OI-NI-1, Attachment 4, Step 2.c)	Calculate Upper Quadrant Power Tilt	Candidate determines upper quadrant power tilt to be 0.53%: (5.125 – 5.075) / (5.125 + 5.075) = 4.902 E-3 (5.1 – 5.05) / (5.1 + 5.05) = 4.9261 E-3 $(4.902E\text{-}3)^2 + (4.9261E\text{-}3)^2$ – (1.48628 * 4.902E-3 *4.9261E-3) = 1.2406 E-5 √(1.2406E-5*2.2334) * 100 = 0.526% Range of 0.52%-0.535% is acceptable. [SAT] [UNSAT]
**2 (Step 2.d)	Calculate Lower Quadrant Power Tilt	Candidate determines lower quadrant power tilt to be 0.90%. (4.925 - 4.85) / (4.925 + 4.85) = 7.673 E-3 (4.9 – 4.875) / (4.9 + 4.875) = 2.5575 E-3 $(7.673E\text{-}3)^2 + (2.5575E\text{-}3)^2$ – (1.48628 * 7.673E-3 * 2.5575E-3) = 3.6245 E-5 √(3.6245E-5 * 2.2334) * 100 = 0.90%

JPM No: RA2 and SA2 Rev 3

JPM Title: Perform a Quadrant Power Tilt Calculation

STEP	ELEMENT	STANDARD
		Range of 0.89% – 0.91% is acceptable. [SAT] [UNSAT]
**3 (Step 2.e)	Verify calculated tilt values are less than current FC-171 indicated tilt values.	Candidate reviews FC-171 and determines that the lower tilt is greater than current FC-171 indicated tilt value. [SAT] [UNSAT]

Termination Criteria: **Calculated upper and lower quadrant power tilts and determined that the lower quadrant power tilts is not within current values specified in FC-171**

JPM No: RA2 and SA2 Rev 3

INITIAL CONDITIONS:	• **ERF and GARDEL are inoperable.** • **Excore detectors are available.** • **I&C measured and recorded voltage readings for the excore detectors per OI-NI-1, NUCLEAR INSTRUMENTATION SYSTEM, Attachment 4, "Quadrant Power Tilt Calculation", Step 2.a.** **FC-171, CORRECTED EXCORE AZIMUTHAL POWER TILT LIMITS, is attached.**

INITIATING CUE:	**You are directed to perform a quadrant power tilt calculation per OI-NI-1, Attachment 4, Step 2, using the information collected by I&C. Based on your calculations, determine if the indicated upper tilt and indicated lower tilt are within the values given in FC-171.**

Applicant Name:____

Upper Quadrant Power Tilt:___________%

Lower Quadrant Power Tilt:___________%

Values within current FC-171 values? ___________________

If not, which one(s) is (are) outside current FC-171 values? _____________

Attachment 4 - Quadrant Power Tilt Calculation

PROCEDURE (continued) (✓) INITIALS

2. IF the Excore Detectors are available AND the ERF is inoperable, THEN perform the following:

a. Notify I&C to connect DMM to the Output test jack on the front of the Power Range Monitor and place the Output Select switch to the position specified and measure and record the following voltages (0-10V):

- AI-31A

  Output Select swt. to LOWER (S_{AL}) 4.875

  Output Select swt. to UPPER (S_{AU}) 5.05

- AI-31B

  Output Select swt. to LOWER (S_{BL}) 4.85

  Output Select swt. to UPPER (S_{BU}) 5.075

- AI-31C

  Output Select swt. to LOWER (S_{CL}) 4.925

  Output Select swt. to UPPER (S_{CU}) 5.125

- AI-31D

  Output Select swt. to LOWER (S_{DL}) 4.9

  Output Select swt. to UPPER (S_{DU}) 5.1 DB I&C

KEY

Attachment 4 - Quadrant Power Tilt Calculation

PROCEDURE (continued) (✓) INITIALS

2 b. As required, request I&C to obtain the following voltage measurements for the control channels:

- AI-31A

  CONTROL CHANNEL A LOWER
  TB(A) 8: 60(+), 59(-), 58(G) (C_{AL}) N/A

  CONTROL CHANNEL A UPPER
  TB(A) 8: 57(+), 56(-), 55(G) (C_{AU}) N/A

- AI-31D

  CONTROL CHANNEL B LOWER
  TB(D) 8: 57(+), 56(-), 55(G) (C_{BL}) N/A

  CONTROL CHANNEL B UPPER
  TB(D) 8: 60(+), 59(-), 58(G) (C_{BU}) N/A TDB
  I&C

c. Calculate the Upper Quadrant Power Tilt using the voltages from Step 2.a:

- $\dfrac{S_{CU} - S_{BU}}{S_{CU} + S_{BU}} = \dfrac{5.125 - 5.075}{5.125 + 5.075} = \underset{(u)}{4.902 \times 10^{-3}}$

- $\dfrac{S_{DU} - S_{AU}}{S_{DU} + S_{AU}} = \dfrac{5.1 - 5.05}{5.1 + 5.05} = \underset{(v)}{4.9261 \times 10^{-3}}$

- $(u)^2 + (v)^2 - [1.48628 \times (u) \times (v)] = \underset{(w)}{1.2406 \times 10^{-5}}$

- $\sqrt{(w) \times 2.2334}$ X 100 = 0.53 % ______

KEY

Attachment 4 - Quadrant Power Tilt Calculation

PROCEDURE (continued) (✓) INITIALS

2 d. Calculate the Lower Quadrant Power Tilt using the voltages from Step 2.a:

- $\frac{S_{CL} - S_{BL}}{S_{CL} + S_{BL}} = \frac{4.925 - 4.85}{4.925 + 4.85} = \frac{7.673 \times 10^{-3}}{(x)}$

- $\frac{S_{DL} - S_{AL}}{S_{DL} + S_{AL}} = \frac{4.9 - 4.875}{4.9 + 4.875} = \frac{2.558 \times 10^{-3}}{(y)}$

- $(x)^2 + (y)^2 - [1.48628 \times (x) \times (y)] = \frac{3.6245 \times 10^{-3}}{(z)}$

- $\sqrt{(z) \times 2.2334} \times 100 =$ 0.90 % ________

e. Verify the Calculated Tilt values are less than the current FC-171 indicated tilt values. ________

f. IF the tilt value for a Safety Channel is greater than the FC-171 indicated tilt value AND is confirmed not to be a channel fault due to a failing detector or power supply,
THEN immediately notify the Reactor Engineer and reference Technical Specification 2.10.4(4). ________

NOTE

This step is an alternate method of calculating Tilt and may be useful as a check of the Azimuthal Tilt Values from the Excore Detectors.

3. IF the Incore Detectors and the ERF are available,
THEN verify incore tilt on the GARDEL MARGIN SUMMARY Panel. ________
STA

CORRECTED EXCORE AZIMUTHAL POWER TILT LIMITS

Azimuthal Tilt	
Safety Channels	
Detectors	**Indicated Tilt (%)**
Upper	Ø.73
Lower	Ø.77
Summed	1.5
Signature (Reactor Engineer): Reactor Engineer	Date: Today

GARDEL is inoperable

Indicated Tilt(%) = 3% Tech Spec Limit (T.S. 2.10.4(4)(b))

Obtain tilt values from ERF computer system:

- Enter "TLT"
- Depress "RPT" (Report) button or print page
- Outputs to printer designated on ERF Page SDD.

Attachment 4 - Quadrant Power Tilt Calculation

PROCEDURE (continued) (✓) INITIALS

2. IF the Excore Detectors are available AND the ERF is inoperable, THEN perform the following:

   a. Notify I&C to connect DMM to the Output test jack on the front of the Power Range Monitor and place the Output Select switch to the position specified and measure and record the following voltages (0-10V):

      - AI-31A

        Output Select swt. to LOWER (S_{AL}) 4.875

        Output Select swt. to UPPER (S_{AU}) 5.05

      - AI-31B

        Output Select swt. to LOWER (S_{BL}) 4.85

        Output Select swt. to UPPER (S_{BU}) 5.075

      - AI-31C

        Output Select swt. to LOWER (S_{CL}) 4.925

        Output Select swt. to UPPER (S_{CU}) 5.125

      - AI-31D

        Output Select swt. to LOWER (S_{DL}) 4.9

        Output Select swt. to UPPER (S_{DU}) 5.1 DB
        I&C

Attachment 4 - Quadrant Power Tilt Calculation

PROCEDURE (continued) (✓) INITIALS

2 b. As required, request I&C to obtain the following voltage measurements for the control channels:

- AI-31A

  CONTROL CHANNEL A LOWER
  TB(A) 8: 60(+), 59(-), 58(G) (C_{AL}) N/A

  CONTROL CHANNEL A UPPER
  TB(A) 8: 57(+), 56(-), 55(G) (C_{AU}) N/A

- AI-31D

  CONTROL CHANNEL B LOWER
  TB(D) 8: 57(+), 56(-), 55(G) (C_{BL}) N/A

  CONTROL CHANNEL B UPPER
  TB(D) 8: 60(+), 59(-), 58(G) (C_{BU}) N/A I&C ______ I&C

c. Calculate the Upper Quadrant Power Tilt using the voltages from Step 2.a:

- $\frac{S_{CU} - S_{BU}}{S_{CU} + S_{BU}} = \frac{\_\_\_\_ - \_\_\_\_}{\_\_\_\_ + \_\_\_\_} = \underset{(u)}{\_\_\_\_\_\_}$

- $\frac{S_{DU} - S_{AU}}{S_{DU} + S_{AU}} = \frac{\_\_\_\_ - \_\_\_\_}{\_\_\_\_ + \_\_\_\_} = \underset{(v)}{\_\_\_\_\_\_}$

- $(u)^2 + (v)^2 - [1.48628 \times (u) \times (v)] = \underset{(w)}{\_\_\_\_\_\_}$

- $\sqrt{(w) \times 2.2334}$ X 100 = ________% ________

Attachment 4 - Quadrant Power Tilt Calculation

PROCEDURE (continued) (✓) INITIALS

2 d. Calculate the Lower Quadrant Power Tilt using the voltages from Step 2.a:

- $\dfrac{S_{CL} - S_{BL}}{S_{CL} + S_{BL}} = \dfrac{\_\_\_\_ - \_\_\_\_}{\_\_\_\_ + \_\_\_\_} = \underset{(x)}{\_\_\_\_\_\_}$

- $\dfrac{S_{DL} - S_{AL}}{S_{DL} + S_{AL}} = \dfrac{\_\_\_\_ - \_\_\_\_}{\_\_\_\_ + \_\_\_\_} = \underset{(y)}{\_\_\_\_\_\_}$

- $(x)^2 + (y)^2 - [1.48628 \times (x) \times (y)] = \underset{(z)}{\_\_\_\_\_\_}$

- $\sqrt{(z) \times 2.2334}$ X 100 = ________% ________

e. Verify the Calculated Tilt values are less than the current FC-171 indicated tilt values. ________

f. IF the tilt value for a Safety Channel is greater than the FC-171 indicated tilt value AND is confirmed not to be a channel fault due to a failing detector or power supply,
THEN immediately notify the Reactor Engineer and reference Technical Specification 2.10.4(4). ________

> **NOTE**
> This step is an alternate method of calculating Tilt and may be useful as a check of the Azimuthal Tilt Values from the Excore Detectors.

3. IF the Incore Detectors and the ERF are available,
THEN verify incore tilt on the GARDEL MARGIN SUMMARY Panel. ________
STA

JOB PERFORMANCE MEASURE

JPM No: RA3 Rev 3

JPM Title: Prepare a Manual Clearance for Maintenance on AC-3C

Location: Classroom

Approximate Time: 20 minutes Start Time:___________________

End Time:____________________

Actual Time: __________________

Reference(s):	K/A# 2.2.13 RO IMP: 4.1 Knowledge of tagging and clearance procedures
	Procedures: SO-G-20A
	Other (tech specs, etc): P&IDs

Handout(s): Three Blank SOMS forms per Candidate

Task List#: 0075

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: Jerry Koske Date: 3/22/2012

JPM No: RA3 Rev 3

JPM Title: Prepare a Manual Clearance for Maintenance on AC-3C

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: _____________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments:

JPM No: RA3 Rev 3

JPM Title: Prepare a Manual Clearance for Maintenance on AC-3C

TASK STANDARD: **The candidate prepared a Manual Clearance in accordance with SO-G-20A. All of the criteria for critical steps 2, 4, 5 and 6 were satisfied.**

INITIAL CONDITIONS: **Maintenance is being planned to replace the impeller on Component Cooling Pump, AC-3C. SOMS is unavailable.**

INITIATING CUE:

You are directed to prepare a manual Clearance for Maintenance on AC-3C in accordance with SO-G-20A using the blank SOMS forms provided. The following information is required:

- **Tag Type**
- **Equipment**
- **Placement Sequence**
- **Placement Configuration**

The Shift Manager has directed that AC-3C's casing vent and drain valves remain closed

Please write your name on each SOMS Form.

JPM No: RA3 Rev 3

JPM Title: Prepare a Manual Clearance for Maintenance on AC-3C

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1	Refer to applicable references: • SO-G-20A • Plant Procedures • P&IDs	Candidate used reference material as required. [SAT] [UNSAT]
**2	Prepare Clearance per SO-G-20A using blank SOMS form	The Control Switch for AC-3C must be first item in the sequence. It is placed in PTL and CAUTION tagged. [SAT] [UNSAT]
3		The breaker 69 switch should be the second item in the sequence. It is placed in PTL with No Tag. [SAT] [UNSAT]
**4		The breaker must be in the sequence before any valves. It is racked out with a DANGER tag. [SAT] [UNSAT]
**5		AC-3C's discharge valve, AC-108, and AC-3C's suction valve, AC-106 must be the next 2 items in the sequence. It is not required that AC-108 be listed before AC-106. Both of these valves must be danger tagged closed. [SAT] [UNSAT]

JPM No: RA3 Rev 3

JPM Title: Prepare a Manual Clearance for Maintenance on AC-3C

STEP	ELEMENT	STANDARD
**6		AC-3C's vent and drain valves, At least 2 of the following valves must be listed: • AC-359 • AC-360 • AC-361 They should be designated as CLOSED (per Initiating Cue) or per Shift Manager Discretion with NO TAG [SAT] [UNSAT]
		Note: AC-163, AC-1116, AC-838 and AC-837 may also be listed but are not required. **Examiner Note: Ensure Candidate has written name on blank SOMS Forms**

Termination Criteria: The candidate has completed the clearance form with the information listed in the initiating Cue.

JPM No: RA3

INITIAL CONDITIONS: **Maintenance is being planned to replace the impeller on Component Cooling Pump, AC-3C. SOMS is unavailable.**

INITIATING CUE: **You are directed to prepare a manual Clearance for Maintenance on AC-3C in accordance with SO-G-20A using the blank SOMS forms provided. The following information is required:**

- **Tag Type**
- **Equipment**
- **Placement Sequence**
- **Placement Configuration**

The Shift Manager has directed that AC-3C's casing vent and drain valves remain closed

Please write your name on each SOMS Form.

Clearance Tag List
Clearance: EXAM
Clearance:

FORT CALHOUN STATION
SOMS FORM

Tag Type / Serial No.	Equipment / *Equipment Description / *Equipment Location		Pla Seq	Placement Configuration / * Notes	Place. 1st Verif Date/Time	Place. 2nd Verif Date/Time		Rest Seq	Rest. Config. *As Left (If Diff.)	Rest.. 1st Verif Date/Time	Rest.. 2nd Verif Date/Time
Caution	AC-3C Control switch CB-1,2,3		1	PTL							
No Tag	1B3C-4C-4 69 switch		2	PTL							
Danger	1B3C-4C-4 Breaker		3	Racked out							
Danger	AC-108 AC-3C Discharg valve		4	Closed							
Danger	AC-106 AC-3C suction valve		5	Closed							
No Tag	AC-359 AC-3C Casing vent		6	Closed							

A-3 KEY

Clearance Tag List
Clearance: EXAM
Clearance:

FORT CALHOUN STATION
SOMS FORM

Tag Type / Serial No.	Equipment / *Equipment Description / *Equipment Location		Pla Seq	Placement Configuration / * Notes	Place. 1st Verif Date/Time	Place. 2nd Verif Date/Time		Rest Seq	Rest. Config. *As Left (If Diff.)	Rest.. 1st Verif Date/Time	Rest.. 2nd Verif Date/Time
No Tag	AC-360		6	Closed							
No Tag	AC-361		6	Closed							

A-3 KEY

JOB PERFORMANCE MEASURE

JPM No: RA4/SA4 Rev 3

JPM Title: Determine if temporary shielding should be requested

Location: Classroom

Approximate Time: 5 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 2.3.12
Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.

K/A# 2.3.7
Ability to comply with radiation work permit requirements during normal or abnormal conditions.
RP-307, "Use and Control of Temporary Shielding", Rev 20

Handout(s): None

Task List#: None (GET Rad Worker Knowledge)

Applicable Position(s): RO/SRO

Time Critical: No

Alternate Path: No

JPM Prepared by: ________________________________ Date: ____________

JPM No: RA4/SA4 Rev 3

JPM Title: Determine if temporary shielding should be requested

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment: Calculator

Safety Considerations: None

Comments:

JPM No: RA4/SA4 Rev 3

JPM Title: Determine if temporary shielding should be requested

TASK STANDARD:	**Applicant calculated total estimated dose for the work without installing shielding to be 140 mrem. Applicant calculated total estimated dose for the work with shielding (including shielding installation) to be approximately 132 mrem. Applicant recommends requesting temporary shielding be installed.**

INITIAL CONDITIONS:	**Work is being planned to be performed in Room 13 near HS#23 which has a 30 cm dose rate reading of 80 mR/hr. This work is performed by one person and is expected to take 1.75 hours. It has been determined that if shielding is installed, the dose rate will decrease to 45 mR/hr. The time for one person to install the shielding is estimated to take 40 minutes.**
INITIATING CUE:	**Determine:** • **The total expected dose for the work if shielding is not installed.** • **The total expected dose if the worker installs the shielding and then performs the work.** **Recommend whether or not temporary shielding should be requested.**

JPM No: RA4/SA4 Rev 3

JPM Title: Determine if temporary shielding should be requested

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
**1	Determine expected dose without shielding.	Applicant determines expected dose without shielding. 80 mR/hr * 1.75 hours = 140 mrem [SAT] [UNSAT]
**2	Determine expected dose with shielding installation.	Applicant determines total expected dose if shielding is installed. 80 mR/hr * 40 min * (1 hr / 60 min) + 45 mR/hr * 1.75 hr = 132 mrem [SAT] [UNSAT]
**3	Determine if shielding should be requested.	Applicant determines that the total dose with shielding is 8 mrem less than the total expected dose without shielding and therefore, temporary shielding should be requested. [SAT] [UNSAT]

Termination Criteria: Applicant has calculated the total expected dose both with and without shielding and has determined that shielding should be requested.

JPM No: SA4 Rev 3

INITIAL CONDITIONS: **Work is being planned to be performed in Room 13 near HS#23 which has a 30 cm dose rate reading of 80 mR/hr. This work is performed by one person and is expected to take 1.75 hours. It has been determined that if shielding is installed, the dose rate will decrease to 45 mR/hr. The time for one person to install the shielding is estimated to take 40 minutes.**

INITIATING CUE: **Determine:**

- **The total expected dose for the work if shielding is not installed.**
- **The total expected dose if the worker installs the shielding and then performs the work.**

Recommend whether or not temporary shielding should be requested.

Applicant Name: ________________________________

Total dose if shielding is NOT installed: _____________

Total dose if shielding is installed: ______________

Recommend requesting temporary shielding (YES or NO)? ____________

JOB PERFORMANCE MEASURE

JPM No: SA1 Rev 3

JPM Title: Calculate amount of water and boric acid required to raise SIRWT level 10 inches and maintain SIRWT concentration

Location: Classroom

Approximate Time: 20 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A 2.1.25
Ability to interpret reference materials, such as graphs, curves, tables, etc.

TDB-V.12, "Miscellaneous Formula Sheet", Rev. 13
TDB-VII, "Tank Curves," Rev.16

Handout(s): None

Task List#: 1192

Applicable Position(s): SRO

Time Critical: No

Alternate Path: No

JPM No: SA1 Rev 3

JPM Title: Calculate amount of water and boric acid required to raise SIRWT level 10 inches and maintain SIRWT concentration

JPM Prepared by: ______________________________ Date: ____________

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment: Calculator

JPM No: SA1 Rev 3

JPM Title: Calculate amount of water and boric acid required to raise SIRWT level 10 inches and maintain SIRWT concentration

Safety Considerations: None

Comments:

TASK STANDARD:	**Applicant calculates the amount of demineralized water and the amount of boric acid to add to the SIRWT to raise level from 185 inches to 195 inches while maintaining current SIRWT concentration. Applicant determines that 6117 gallons of water (6110-6125 gal) and 3883 gallons of boric acid (3875-3890) must be added.**
INITIAL CONDITIONS:	• **Current SIRWT level is 185 inches.** • **Current SIRWT boric acid concentration is 2247 ppm.** • **Both BAST's most recent sample indicate 3.31 %wt boric acid.**
INITIATING CUE:	**You have been asked to determine that total number of gallons required to raise SIRWT level 10 inches to a final level of 195 inches. You have also been asked to determine that amount of demineralized water and the amount of water from the BAST's required to raise the SIRWT 10 inches while maintaining current SIRWT boric acid concentration. Calculations that are normally used for determining additions to the RCS can be used for the SIRWT without change.**

JPM No: SA1 Rev 3

JPM Title: Calculate amount of water and boric acid required to raise SIRWT level 10 inches and maintain SIRWT concentration

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
**1 TDB-VII	Determine total number of gallons required to raise SIRWT level from 185 inches to 195 inches.	Applicant determines from the graph that approximately 10,000 total gallons are required to raise SIRWT level 10 inches (330,000 -320,000 = 10,000 gallons). (9,950 – 10,050 gallons acceptable) [SAT] [UNSAT]
**2 TDB-V.12	Determine number of gallons of demineralized water and number of gallons of water from BAST's	Gal water / gal acid = (1748*3.31%) / 2247 ppm -1 = 1.575 Gal water = 1.575 * gal acid Gal water + gal acid = 10,000 gal 2.575 gal acid = 10,000 gal Gal acid =3883.5 gal (3875-3890 gal) Gal water = 10,000 - 3883.5 = 6116.5 gal (6110 – 6125 gal) OR Gal water = 1.575 * 3883.5 = 6116.5 gal (6110-6125) [SAT] [UNSAT]

JPM No: SA1 Rev 3

JPM Title: Calculate amount of water and boric acid required to raise SIRWT level 10 inches and maintain SIRWT concentration

Termination Criteria:	**Applicant has calculated that it will require 3884 (3875 – 3890) gallons of boric acid and 6117 (6110 – 6125) gallons of demineralized water for a total of 10,000 (9,950 -10,050) gallons to raise SIRWT level 10 inches while maintaining current SIRWT boric acid concentration.**

JPM No: SA1 Rev 3

INITIAL CONDITIONS:	• **Current SIRWT level is 185 inches.** • **Current SIRWT boric acid concentration is 2247 ppm.** • **Both BAST's most recent sample indicate 3.31 %wt boric acid.**

INITIATING CUE: **You have been asked to determine that total number of gallons required to raise SIRWT level 10 inches to a final level of 195 inches. You have also been asked to determine that amount of demineralized water and the amount of water from the BAST's required to raise the SIRWT 10 inches while maintaining current SIRWT boric acid concentration. Calculations that are normally used for determining additions to the RCS can be used for the SIRWT without change.**

Applicant Name: ________________________________

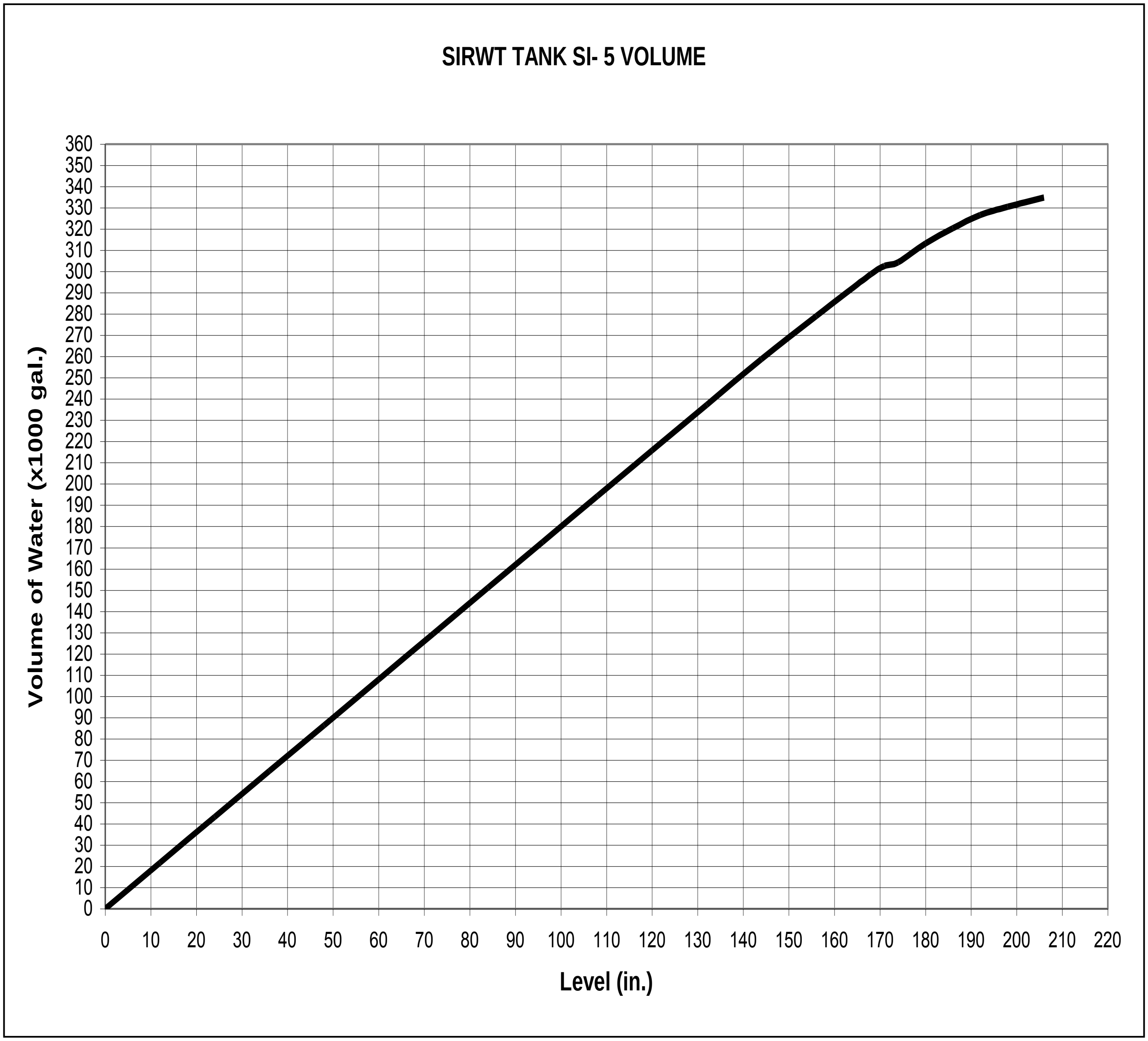
Total number of gallons to raise SIRWT level from 185 to 195 inches:

____

Amount of demineralized water: ____________________

Amount of borated water from the BAST's: ____________________

Safety Injection and Refueling Water Tank (SIRWT), SI-5



Minimum of 283,000 gallons of usable water above 16" recirculation level (approx. 28,000 gal) per Tech Spec 2.1.4(5). Hence minimum tank level is 311,000 gal at 180". Reference calculation FC07376.

BLEND

$$\frac{\text{GAL WATER}}{\text{GAL ACID}} = \left[\frac{1748 * \text{CA}}{\text{C LOOP}}\right] - 1$$

OR

$$\text{DEMIN WATER FLOW} = (\text{BA FLOW})(1748 * \text{CA} - \text{C LOOP}) / \text{C LOOP}$$

PPM = (% WT) * (1748)

CA	=	CONCENTRATION IN BORIC ACID TANK (% WT)
CI	=	INITIAL CONCENTRATION OF RCS (PPM)
CF	=	FINAL CONCENTRATION OF RCS (PPM)
C LOOP	=	CONCENTRATION OF RCS LOOP (PPM)
BA	=	BORIC ACID
DEMIN FLOW	=	GALLONS PER MINUTE (GPM)
BA FLOW	=	GALLONS PER MINUTE (GPM)
HZP	=	Hot Zero Power (Tavg = 532°F and Pressurizer Level = 48%)
HFP	=	Hot Full Power (Tavg = 567.6°F and Pressurizer Level = 60%)

SUBCRITICAL MULTIPLICATION

$$\frac{\text{CR1}}{\text{CR2}} = \frac{(1 - K_{EFF2})}{(1 - K_{EFF1})} \frac{\text{CR INITIAL}}{\text{CR FINAL}} = \frac{1}{M}$$

JOB PERFORMANCE MEASURE

JPM No: SA3 Rev 3

JPM Title: Review a Manual Clearance for Maintenance on AC-3C

Location: Classroom

Approximate Time: 20 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s):	K/A# 2.2.13 RO IMP: 4.1 Knowledge of tagging and clearance procedures
	Procedures: SO-G-20A
	Other (tech specs, etc): P&IDs

Handout(s): Filled out SOMS Forms

Task List#: 0075

Applicable Position(s): SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: Jerry Koske Date: 3/22/2012

JPM No: SA3 Rev 3

JPM Title: Review a Manual Clearance for Maintenance on AC-3C

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: _____________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments:

JPM No: SA3 Rev 3

JPM Title: Review a Manual Clearance for Maintenance on AC-3C

TASK STANDARD: **The Applicant reviewed the Manual Clearance in accordance with SO-G-20A. The Applicant did not approve the Clearance because items were not listed in the required sequence. The Control Switch in the Control Room should have been the first item in the sequence.**

INITIAL CONDITIONS: **Maintenance is being planned to replace the impeller on Component Cooling Pump, AC-3C. SOMS is unavailable. A Manual Clearance has been prepared.**

INITIATING CUE:

You are directed to perform a SRO review of the manual Clearance for Maintenance on AC-3C in accordance with SO-G-20A. The following information should be reviewed:

- **Tag Type**
- **Equipment**
- **Placement Sequence**
- **Placement Configuration**

The Shift Manager has directed that AC-3C's casing vent and drain valves remain closed

---

JPM No: SA3 Rev 3

JPM Title: Review a Manual Clearance for Maintenance on AC-3C

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1	Reviewed Manual Clearance form.	Applicant reviewed Form [SAT] [UNSAT]
2	Refer to applicable references: • SO-G-20A • Plant Procedures • P&IDs	Applicant used reference material as required. [SAT] [UNSAT]
3**	Approve Clearance	The Applicant did not approve the clearance (Circled NO) because the Control Switch for AC-3C must be first item in the sequence. [SAT] [UNSAT]
		Note: the Applicant may also wish to add AC-163, AC-1116, AC-838 and AC-837 to the Clearance.

Termination Criteria: The Applicant has completed the clearance form with the information listed in the initiating Cue.

JPM No: SA3 Rev 3

INITIAL CONDITIONS: **Maintenance is being planned to replace the impeller on Component Cooling Pump, AC-3C. SOMS is unavailable. A Manual Clearance has been prepared.**

INITIATING CUE: **You are directed to perform a SRO review of the manual Clearance for Maintenance on AC-3C in accordance with SO-G-20A. The following information should be reviewed:**

- **Tag Type**
- **Equipment**
- **Placement Sequence**
- **Placement Configuration**

The Shift Manager has directed that AC-3C's casing vent and drain valves remain closed

---

Name:____

Approve Clearance: (Circle One) YES NO

If you did not approve, specify why below:

Clearance Tag List
Clearance: EXAM
Clearance: AC-3C

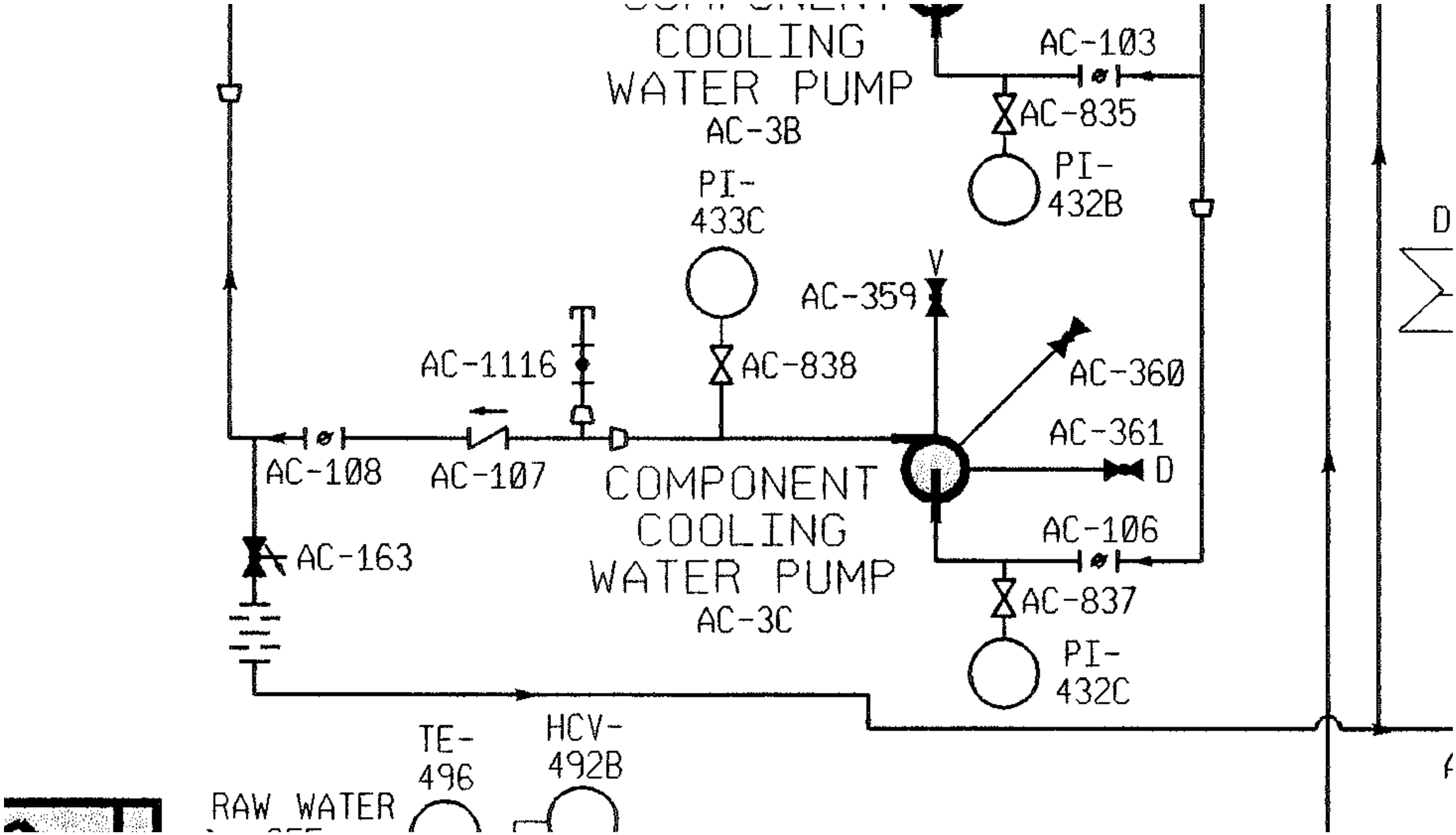
FORT CALHOUN STATION
SOMS FORM

Tag Type -------- Serial No.	Equipment ----------------- *Equipment Description *Equipment Location		Pla Seq	Placement Configuration ----------------- * Notes	Place. 1st Verif Date/Time	Place. 2nd Verif Date/Time		Rest Seq	Rest. Config. *As Left (If Diff.) -----------------	Rest.. 1st Verif Date/Time	Rest.. 2nd Verif Date/Time
No Tag	1B3C-4C-4 69 switch		1	PTL							
Danger	1B3C-4C-4 Breaker		2	Racked OUT							
CAUTion	AC-3C Control Switch CB-1,2,3		3	PTL							
Danger	AC-108 AC-3C Discharg valve		4	Closed							
Danger	AC-106 AC-3C suction valve		5	closed							
NoTag	AC-359 AC-3C casing venT		6	closed							

Clearance Tag List
Clearance: EXAM
Clearance: AC - 3C

FORT CALHOUN STATION
SOMS FORM

Tag Type -------- Serial No.	Equipment ----------------- *Equipment Description *Equipment Location		Pla Seq	Placement Configuration ------------------ * Notes	Place. 1st Verif Date/Time	Place. 2nd Verif Date/Time		Rest Seq	Rest. Config. *As Left (If Diff.) ------------------	Rest.. 1st Verif Date/Time	Rest.. 2nd Verif Date/Time
No Tag	AC-360		6	Closed							
No Tag	AC-361		6	Closed							



COOLING
WATER PUMP
AC-3B
AC-103
AC-835
PI-
432B
PI-
433C
AC-359
V
AC-1116
AC-838
AC-360
AC-361
D
AC-108
AC-107
COMPONENT
COOLING
WATER PUMP
AC-3C
AC-106
AC-163
AC-837
PI-
432C
TE-
496
HCV-
492B
RAW WATER
D

JPM No: SA5 Rev 3

JPM Title: Classify Emergency Action Levels and make Protective Action Recommendations

Location: Classroom

Approximate Time: 12 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s):

1. K/A# 000000 2.4.41 (SRO 4.6): Knowledge of the emergency action level thresholds and classifications.
2. K/A# 000000 2.4.44 (SRO 4.4): Knowledge of emergency plan protective action recommendations.
3. EPIP-OSC-1, EMERGENCY CLASSIFICATION.
4. TBD-EPIP-OSC-1A, Recognition Category A - Hazards and Other Conditions Affecting Plant Safety.
5. EPIP-EOF-7, PROTECTIVE ACTION GUIDELINES.

Task List#: 1453

Applicable Position(s): SRO

Time Critical: YES

Alternate Path: NO

JPM Prepared by: Jerry Koske Date: 3/8/2012

JPM No: SA5 Rev 3

JPM Title: Classify Emergency Action Levels and make Protective Action Recommendations

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ____________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment: None

Safety Considerations: None

Comments:

JPM No: SA5 Rev 3

JPM Title: Classify Emergency Action Levels and make Protective Action Recommendations

TASK STANDARD: **The SRO Applicant reviewed the plant conditions, referred to EPIP-OSC-1A and TDB-IV.8 and classified the event as a General Emergency, IC AG1, EAL 1. Within 15 minutes of classifying the event, the Applicant determined that the Protective Action Recommendation is to evacuate all sectors 0-2 miles and completed page one of form FC-1188 so that offsite notifications can be made.**

INITIAL CONDITIONS:

- **A loose parts monitoring alarm came in an hour ago**
- **20 minutes ago, the reactor tripped on TMLP and Radiation Monitors RM-057 and RM-054A alarmed**
- **EOP-00 Standard Post Trip Actions have been completed and EOP-04 has been entered**
- **The ERO was activated and an Alert was declared based on FA1, EAL 2, Loss of RCS Barrier.**
- **Attempts to isolate Steam Generator RC-2A have been unsuccessful.**
- **RM-064 has been placed in service and it's S/G A reading has increased from 975 cpm to 990 cpm over the past 15 minutes.**
- **The wind is from 180° @ 15 mph.**
- **The Met Tower ΔT is -1.3°C/100m**
- **There is no precipitation**
- **Dose Assessment has not yet been performed**

INITIATING CUE

You are the Shift Manager. Determine the appropriate IC and EAL, if any, in accordance with EPIP-OSC-1.

JPM No: SA5 Rev 3

JPM Title: Classify Emergency Action Levels and make Protective Action Recommendations

CUE #2: ***********TIME CRITICAL JPM***************

Specify any Protective Action Recommendations and Complete Form FC-1188.

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1	Refer to Emergency Plan.	Refer to TBD-EPIP-OSC-1A. [SAT] [UNSAT]
2**	Classify the event.	This Event should be classified as a GENERAL EMERGENCY using IC AG1, EAL 1. [SAT] [UNSAT]
3**	Determine Protective Action Recommendations and fill out form FC-1188 for notifications.	***** **TIME CRITICAL** ***** **Provide CUE# 2 and Blank FC-1188 to Applicant** Start Time: ______________ Form FC-1188 must be filled out within 15 minutes and must contain the following information: • Initial Declaration • General Emergency • IC#: AG1 • EAL: 1 (Loss) • PARs: EVACUATE all

JPM No: SA5 Rev 3

JPM Title: Classify Emergency Action Levels and make Protective Action Recommendations

STEP	ELEMENT	STANDARD
		Sectors, 0-2 Miles End Time:____________ Elapsed Time:__________ [SAT] [UNSAT]
4.	Non-Critical Form FC-1188 Information	• Prognosis: Worsening • Plant Status: Shutdown • Wind Direction:180° • Wind Speed:15 MPH • Precipitation: No • Temperature difference: -1.3 °C/100m • Stability Class: D • There is an airborne release • Approval Signature, date and time

Termination Criteria: The Event has been classified and PARs have been made.

JPM No: SA5 Rev 3

INITIAL CONDITIONS:

- **A loose parts monitoring alarm came in an hour ago**
- **20 minutes ago, the reactor tripped on TMLP and Radiation Monitors RM-057 and RM-054A alarmed**
- **EOP-00 Standard Post Trip Actions have been completed and EOP-04 has been entered**
- **The ERO was activated and an Alert was declared based on FA1, EAL 2, Loss of RCS Barrier.**
- **Attempts to isolate Steam Generator RC-2A have been unsuccessful.**
- **RM-064 has been placed in service and it's S/G A reading has increased from 975 cpm to 990 cpm over the past 15 minutes.**
- **The wind is from 180° @ 15 mph.**
- **The Met Tower ΔT is -1.3°C/100m**
- **There is no precipitation**
- **Dose Assessment has not yet been performed**

INITIATING CUE: **You are the Shift Manager. Determine the appropriate IC and EAL, if any, in accordance with EPIP-OSC-1.**

Applicant Name: ______________________________

Event Classification (circle one): NONE NOUE ALERT SAE GE

IC#________________ EAL#______________

Time of Declaration:______________

JPM No: SA5 Rev 3

CUE #2: ***********TIME CRITICAL JPM***************

Specify any Protective Action Recommendations and Complete Form FC-1188.

********************** KEY ***************************

FORT CALHOUN STATION – EMERGENCY NOTIFICATION FORM

Off-Site Contact Time:	Person Making Off-Site Report:	Contactor's Call Back #:
Time	Name	Phone #

1. [X] **Initial Declaration** – for **Initial** declaration of any emergency classification
   [ ] **Hourly – When** completing **Hourly** updates, one hour from time of the most recent event notification and on an hourly basis until event termination.
   [ ] **PAR Change** – **Any** change in Protective Action Recommendations (PARs) and a new classification is not being declared.
   [ ] **Shiftly** during ongoing events **IF** requested by the states **AND** the status of the event has not changed.
   [ ] **Termination** - Requirements of EPIP-OSC-2, Attachment 6.6, must be met.

2. Classification:	3. IC#:	4. EAL#: 1 (If Fission Product Barrier, complete box #7)
[ ] NOUE | [ ] Alert | [ ] Site Area | [X] General | [ ] None	AG1	

5. Time Event Declared:	6. Time Event Terminated:	7. Complete if Fission Product Barrier
Time		**Fuel Cladding:** EAL # N/A Loss/ Potential Loss (Circle one)
8. Prognosis: [ ] Stable [X] Worsening	9. Plant Status: [ ] At Power [X] Shutdown	**RCS:** EAL # N/A Loss / Potential Loss (Circle one) **Containment:** EAL# N/A Loss / Potential Loss (Circle one)

OBTAIN METEOROLOGICAL DATA FROM **ERF PAGE 197** (see Note 1 on page 2, if ERFCS is unavailable)

10. Wind From Degrees(10m):	11. Wind Speed MPH (Use Slowest 10m):	12. Precipitation:
180°	15 MPH	[ ] Yes [X] No

13. Temperature Difference -1.3 °C/100m (use most positive ΔT)

14. Stability Class	-[ ] A	[ ] B	[ ] C	[X] D	[ ] E	[ ] F	[ ] G+
	≤ -1.9	>-1.9 to ≤ -1.7	> -1.7 to ≤ -1.5	> -1.5 to ≤ -0.5	> -0.5 to ≤ 1.5	> 1.5 to ≤ 4.0	> 4.0

15. There			
	[X] is [ ] was [ ] will be	[ ] no [X] an airborne [ ] a liquid	release of radioactive effluent to the environment that is the result of or associated with this event

REVIEW **EPIP-EOF-7** FOR GUIDANCE ON PARS

16 Protective Action Recommendations (PARs)

	None	Evacuate Sectors	Shelter Sectors
0-2 Miles		ALL	
2-5 Miles			
5-10 Miles			

17. Remarks

Approved: Signiture	Date: Date	Time: Time

CONFIRMED TIME (COUNTY USE ONLY) _________

********************** KEY ***************************

JOB PERFORMANCE MEASURE

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

Location: Auxiliary Building

Approximate Time: 20 minutes Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A#: 000061, K3.01, A2.04
Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: pump failure or improper Operation.

Procedures: AOP-28, Section III, “Steam/Air Bound AFW Pumps” Revision 16

Handout(s): AOP-28, Section III

Task List#: 0107

Applicable Position(s): RO, SRO-I, SRO-U

Time Critical: No

Alternate Path: No

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

JPM Prepared by: ________________________________ Date: ____________

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment: None

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

Safety Considerations: Take precautions in the vicinity of hot piping and steam drains

Comments: This JPM will be conducted as a static JPM in the plant.

TASK STANDARD: **Respond to a steam bound auxiliary feedwater pump, take the necessary corrective actions, and restart auxiliary feedwater pump FW-6.**

INITIAL CONDITIONS: **The plant is in hot shutdown. FW-10 and FW-54 are out of service. When attempting to feed the steam generators using auxiliary feedwater pump FW-6, feedwater flow to the steam generators lowered. FW-6 is suspected to be steam or air bound due to low flow and oscillating amps. S/G pressure is 900 psia.**

INITIATING CUE: **CRS directs you to restore normal flow from Auxiliary Feedwater Pump, FW-6, to service using AOP-28, Section III.**

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

Critical Steps shown in gray AND **

STEP	ELEMENT	STANDARD
1	Obtain a copy of AOP-28 Section III.	Knowledge of where to obtain a copy of AOP-28 [SAT] [UNSAT] **CUE: Provide copy of AOP-28, Section III.**
2 (AOP-28, Section III, Step 1)	Check that discharge pipe temperature is greater than 260°F for at least one of the following Aux Feedwater Pumps (Room 19): TI-1382 FW-6, Electric AFW Pump (FW-6 Discharge Temperature Indicator)	<u>Room 19</u> Checks TI-1382 for temperature. [SAT] [UNSAT] **TI-1382 reads approximately 275°F.** **CUE: Do not allow candidate to enter FW-10 cage. If checked, TI-1383 reads approximately 85°F.**

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

STEP	ELEMENT	STANDARD
3 (Step 2)	IF discharge pipe temperature for FW-6 is greater than 260°F, THEN stop FW-6.	**CUE: IF Applicant contacted Control Room, Control Room directs you to stop the pump locally.** Stopped the pump locally by depressing RED local Stop button. RED light OFF and GREEN light ON [SAT] [UNSAT]
4 (Step 3)	**IF** discharge pipe temperature for FW-10, Steam AFW Pump, is greater than 260°F,	Procedure step 3 N/A.
5	**<u>CAUTION</u>** Opening AFW Pump Drain Valves may cause steam to issue.	Read caution. [SAT] [UNSAT]
**4 (Step 4.a)	IF FW-6 is the affected pump, THEN vent FW-6 by performing the following (Room 19): a. Unlock and close FW-171, "MOTOR DRIVEN AUX FEED PUMP FW-6 DISCHARGE VALVE".	**Examiner NOTE: Valve is hard to move, Applicant may use valve wrench.** **Acknowledge Deviation Log Entry** <u>Room 19</u> FW-171 unlocked and close in clockwise direction. [SAT] [UNSAT] **CUE: Stem lowers until resistance is felt.**
**5 (Step 4.b)	Open FW-688, "MOTOR-	<u>Room 19</u>

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

STEP	ELEMENT	STANDARD
	DRIVEN AUX FEED PUMP FW-6 DISCHARGE DRAIN VALVE".	Opened FW-688 by turning counter-clockwise. [SAT] [UNSAT] **CUE: Stem rises, steam observed.**
**6 (Step 4.c)	**WHEN** a steady stream of water issues from the drain valve, **THEN** close the drain valve.	**CUE 1: A steady stream of water is observed.** <u>Room 19</u> Closed FW-688 (clockwise) following cue 1. [SAT] [UNSAT] **CUE 2: Stem lowers until resistance is felt.**
		CUE: If candidate reads TI-1382 again, it reads approximately 170°F
7 (Step 5)	**IF** EFWST level was less than 25%, **THEN** vent Auxiliary Feedwater suction pipe by performing the following:	**CUE: EFWST level never fell below 25%.** Step is N/A
8 (Note)	**<u>NOTE</u>** The "43/FW" Switch lines up nine pumps for Auto-Start operation. Auto start is inhibited for these nine pumps if the "43/FW" Switch is in the "OFF" position.	Note reviewed. [SAT] [UNSAT]
9 (Step 6.a)	IF FW-6 is the affected pump,	Contacted control room to

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

STEP	ELEMENT	STANDARD
	THEN verify operability of FW-6 by performing the following: a. Place the "43/FW" Switch in "OFF".	place 43/FW switch in OFF. [SAT] [UNSAT] **CUE: 43/FW switch is in OFF.**
10 (Step 6.b)	Open FW-175, "MOTOR-DRIVEN AUX FEED PUMP FW-6 DISCHARGE PRESS INDIC PI-1379 ROOT VALVE" (Room 19).	<u>Room 19</u> Opened FW-175 (counter-clockwise). [SAT] [UNSAT] **CUE: FW-175 stem rises until resistance is felt.**
11 (Step 6.c)	Start FW-6, Electric AFW Pump.	**CUE: IF Applicant contacted Control Room, Control Room directs you to start the pump locally.** Started the pump locally by depressing local Start button. RED light ON and GREEN light OFF [SAT] [UNSAT] **CUE: FW-6 red light is ON and you hear pump noise.**
12 (Step 6.d)	Allow FW-6 to run until pressure on PI-1379, "FW-6 DISCH. PRESSURE" (Room 19), is greater than S/G(s) pressure.	<u>Room 19</u> Checked PI-1379 to determine discharge pressure. [SAT] [UNSAT] **CUE: Indicator reads 1200 psia.**

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

STEP	ELEMENT	STANDARD
13 (Step 6.e)	Stop FW-6, Electric AFW Pump.	**CUE: IF Applicant contacted Control Room, Control Room directs you to stop the pump locally.** Stopped the pump locally by depressing RED local Stop button. RED light OFF and GREEN light ON [SAT] [UNSAT]
14 (Step 6.f)	**(Local)** Verify that FW-6 stops (Room 19).	<u>Room 19</u> Verify green light is lit. [SAT] [UNSAT] **CUE: Green light is lit. No motor noise. Pump shaft is not moving.**
**15 (Step 6.g)	Open and lock FW-171, "MOTOR-DRIVEN AUX FEED PUMP FW-6 DISCHARGE VALVE".	<u>Room 19</u> FW-171 opened (counter-clockwise) and locked. [SAT] [UNSAT] **CUE: FW-171 stem rises until resistance is felt, Locked with padlock (if applicant completes this action)**

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

STEP	ELEMENT	STANDARD
**16 (Step 6.h)	Start FW-6, Electric AFW Pump.	**CUE: IF Applicant contacted Control Room, Control Room directs you to start the pump locally.** Started the pump locally by depressing local Start button. RED light ON and GREEN light OFF [SAT] [UNSAT] **CUE: FW-6 red light is ON, you hear pump noise.**
17 (Step 6.i)	Monitor pressure on PI-1379, "FW-6 DISCH. PRESSURE" (Room 19), for any abnormal fluctuation.	<u>Room 19</u> Checks PI-1379 for fluctuation. [SAT] [UNSAT] **CUE: Indicator for PI-1379 reads 980 psia and is stable.**
18 (Step 7)	**IF** the Plant is in Mode 1, **THEN** place the "43/FW" Switch in "AUTO".	This step N/A [SAT] [UNSAT]
19 (Step 8)	Restore AFW to the desired lineup PER OI-AFW-1, Auxiliary Feedwater Actuation System Normal Operation.	**CUE: Another operator will perform OI-AFW-1.**
20 (Step 9)	Ensure **BOTH** of the following valves are closed (Room 19): FW-175, "MOTOR-DRIVEN AUX FEED PUMP FW-6 DISCHARGE PRESS INDIC PI-1379 ROOT VALVE"	<u>Room 19</u> FW-175 is closed (clockwise). [SAT] [UNSAT] **CUE: FW-175 stem position lowers until resistance if felt.**

JPM No: JPM-P1 Rev 3

JPM Title: Respond to a steam bound auxiliary feedwater pump

Termination Criteria: **Pump FW-6 is running and supplying AFW flow to the steam generators.**

JPM No: P1 Rev 3

INITIAL CONDITIONS: **The plant is in hot shutdown. FW-10 and FW-54 are out of service. When attempting to feed the steam generators using auxiliary feedwater pump FW-6, feedwater flow to the steam generators lowered. FW-6 is suspected to be steam or air bound due to low flow and oscillating amps. S/G pressure is 900 psia.**

INITIATING CUE: **CRS directs you to restore normal flow from Auxiliary Feedwater Pump, FW-6, to service using AOP-28, Section III.**

JOB PERFORMANCE MEASURE

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

Location: Electrical Lab

Approximate Time: 20 minutes

Start Time:__________________

End Time:____________________

Actual Time: __________________

Reference(s): K/A# 062000 A4.04
Ability to manually operate and/or monitor in the Control Room: Local operation of breakers

Procedures: OI-EE-1A, Attachment 2, "Racking Down A Non-Remote Equipped 4160 V Breaker." Rev 25

Handout(s): OI-EE-1A, Attachment 2

Task List#: 0296

Applicable Position(s): AO/RO/SRO

Time Critical: No

Alternate Path: No

JPM Prepared by: Jerry Koske Date: 3/22/12

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments:

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

TASK STANDARD: **The Applicant racked down the 4160 Volt breaker in accordance with OI-EE-1A, Attachment 2. The breaker was left in its cubicle with the wheels blocked and the cubicle door closed.**

INITIAL CONDITIONS: **The plant is in mode 4.**

INITIATING CUE: **You are directed to rack down a 4160 Volt breaker per OI-EE-1A Attachment 2**

Racking down is associated with an emergency condition. Therefore, arc flash protection clothing and establishment of a flash protection boundary is not required.

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1	**<u>CAUTIONS</u>** As a minimum, the following protective clothing shall be worn when raising or lowering 4160 Volt breakers for all persons within the Flash Protection Boundary: 40 calorie arc flash protection clothing Safety glasses Hearing protection 2. A Flash Protection Boundary shall be established at all doors to the Switchgear room of the breaker. If a roll up door is required to be open, the Flash Protection Boundary shall be established at all exterior doors into both Switchgear rooms. 3. A safety monitor shall be established inside the Flash Protection Boundary to: a. Monitor the Flash Protection Boundary to prevent entry by personnel not wearing minimum required protective clothing during the racking evolution. b. Provide emergency aid to persons within the Flash Protection Boundary, if needed. 4. All personnel in the area shall stand clear of the breaker cubicle front. 5. When raising or lowering a breaker, your head must be turned or your eyes covered to protect against possible electrical flash.	Applicant read cautions [SAT] [UNSAT]

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

STEP	ELEMENT	STANDARD
	6. Operate the Breaker Elevator Motor with one hand, standing to one side of the cubicle. 7. Do not energize the motor circuit or interrupt raising or lowering a breaker using the Motor Raise/Lower selector switch. 8. The breaker springs will discharge as the breaker is lowered.	
2 (1.a)	Complete the following to rack down a circuit breaker: 1. Ensure breaker control switch, is in PULL-TO-LOCK (Control Room).	**CUE: Control Room breaker control switch is in PULL-TO-LOCK** [SAT] [UNSAT]
3 (1.b)	Ensure the green indicating light is on (local switchgear cabinet).	Verified the GREEN light was ON. [SAT] [UNSAT]
**4 (1.c)	Ensure the breaker 69 permissive switch, on the local switchgear cabinet, is in PULL-TO-LOCK.	Placed the breaker 69 switch in PULL-TO-LOCK [SAT] [UNSAT]
5	**<u>NOTE</u>** To prevent disturbing protective relays, breaker cubicle doors should be opened and closed carefully.	Read Note [SAT] [UNSAT]
6 (1.d)	Verify the breaker local open/closed indicator displays OPEN.	Verified the local indicator displayed OPEN [SAT] [UNSAT]

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

STEP	ELEMENT	STANDARD
**7 (1.e)	Press the manual trip push button.	Pressed the manual TRIP pushbutton [SAT] [UNSAT]
**8 (1.f)	Install, latch, and plug in the elevator motor into the cubicle elevating mechanism.	Installed, latched and plugged in the elevator motor [SAT] [UNSAT]
**9 (1.g)	Place the elevator motor control selector switch in the LOWER position.	Placed the elevator motor control selector switch in the LOWER position. [SAT] [UNSAT]
**10 (1.h)	Pull the clutch handle above the elevator motor towards the motor until it engages the elevator motor lowering the breaker until the elevator motor limits out.	Pulled the clutch handle toward the motor until it engages and lowered the breaker to the lower limit. [SAT] [UNSAT]
**11 (1.i)	Release the clutch handle.	Released the clutch handle [SAT] [UNSAT]
**12 (1.j)	Place the elevator motor selector switch in OFF and remove from the cubicle elevating mechanism.	Placed the elevator motor selector switch in OFF and removed the motor from the elevating mechanism. [SAT] [UNSAT]
		CUE: The Reactor is in Mode 4 and the equipment associated with this breaker is required to be available per SO-O-21

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

STEP	ELEMENT	STANDARD
13 (2)	IF the reactor operating condition is in Mode 4 or 5 AND the associated 2.equipment is required to be available per SO-O-21, THEN maintain the breaker in its cubicle AND block the breaker wheels.	Maintained breaker in cubicle. Blocked the breaker wheels. [SAT] [UNSAT]
13	**NOTE** Use only the breaker handles to pull the breaker from its cubicle.	Read Note. [SAT] [UNSAT]
14 (3.a)	WHEN the breaker is racked down, 3.THEN complete the following: a. Place the breaker in one of the following conditions: The breaker is removed from the cubicle AND stored per SO-G-107. The breaker is in its cubicle AND the breaker wheels are blocked.	Verified breaker in cubicle with wheels blocked. [SAT] [UNSAT]
15	**NOTE** To prevent disturbing protective relays, breaker cubicle doors should be opened and closed carefully.	Read Note [SAT] [UNSAT]
**16 (3.b)	Raise the upper door hinge arm AND carefully close the cubicle door.	Raised the upper door hinge and closed the cubicle door. [SAT] [UNSAT]

JPM No: P-2 Rev 3

JPM Title: Racking Down a Non-Remote Equipped 4160 V Circuit Breaker

STEP	ELEMENT	STANDARD
17 (3.c)	If desired, return elevator motor and protective clothing to their proper storage place.	**CUE: Leave motor in the Lab** [SAT] [UNSAT]

Termination Criteria: Breaker has been racked down, wheels blocked and cubicle door closed.

JPM No:

INITIAL CONDITIONS: **The plant is in mode 4.**

INITIATING CUE: **You are directed to rack down a 4160 Volt breaker per OI-EE-1A Attachment 2**

Racking down is associated with an emergency condition. Therefore, arc flash protection clothing and establishment of a flash protection boundary is not required.

JOB PERFORMANCE MEASURE

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

Location: RCA

Approximate Time: 30 minutes

Start Time:__________________

End Time:____________________

Actual Time: _________________

Reference(s): K/A# 071000 A4.05 RO IMP: 2.6 SRO IMP:2.6
Ability to manually operate and/or monitor in the control room: Gas decay tanks, including valves, indicators, and sample line.

Procedures: OI-WDG-1, Attachment 3, "Waste Gas Transfer from the Vent Header to a Waste Gas Decay Tank", Rev 42

Handout(s): OI-WDG-1, Attachment 3

Task List#: 0736

Applicable Position(s): EONA/RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: Jerry Koske Date: 3/21/2012

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations: Requires RCA Entry

Comments:

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

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TASK STANDARD: **The Applicant transferred waste gas from the vent header to the in-service Gas Decay Tank in accordance with OI-WDG-1, Attachment 3. Prior to starting WD-28A, the Applicant drained the moisture separator tank.**

INITIAL CONDITIONS: **Vent header pressure is at 2 psig. CCW cooling water is lined up and providing cooling to WD-28A, "A" Waste Gas Compressor. The pressure of the in-service Waste Gas Decay Tank, WD-29B, is 45 psig. AI-110 is inoperable. The Shift Chemist is on standby to take samples when notified. PI-686 is out of service.**

INITIATING CUE: **You are directed to pump the vent header to the in service gas decay tank using WD-28A until vent header pressure has been reduced to 1.0 psig using OI-WDG-1, Attachment 3. All prerequisites are met.**

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1 (1)	IF it is desired to pump the vent header below 1.0 psig, THEN perform Steps 1 through 4 of Attachment 7.	Determined that it was not desired to pump below 1.0 psig. Marked step as N/A [SAT] [UNSAT]
2	**CAUTION** To prevent an uncontrolled release of radioactive gas to the Auxiliary Building and a possible Ventilation Isolation Actuation Signal (VIAS), the Waste Gas Vent Header shall not be drained while a VCT Gas Sample is being drawn.	Candidate read Caution [SAT] [UNSAT]
3 (2)	Ensure the following VCT Gas Space Sampling valves are closed (AI-110, Waste Gas analyzer): • WD-242 • WD-1080	AI-110 Verified WD-242 and WD-1080 are closed. **Note: Inform candidate that visual indication of valve position is all that is required. Valve is closed when handle is perpendicular to piping.** [SAT] [UNSAT]

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

STEP	ELEMENT	STANDARD
4 (3)	Verify the Waste Gas Vent Header is void of water by performing the following steps (Room 13):	<u>Room 13</u> **Examiner CUE: Before Applicant enters room 13, tell Applicant that "The vent header in room 13 has been drained, Step 3 is complete" (ALARA)**
5	**<u>NOTE</u>** LCV-533B, Moisture Separator A Makeup Control Valve, and LCV-534B, Moisture Separator B Makeup Control Valve, will only open when there is a low level. **<u>CAUTION</u>** To prevent pump rotor failure, a Waste Gas Compressor must not be run dry.	Candidate read note and caution [SAT] [UNSAT]
6 (4.a)	Ensure the selected Waste Gas Compressor is operable and primed by performing the following steps (Room 16): a. Ensure the Seal Water Isolation Valve to the Waste Gas Compressor Skid is open: • WD-28A, DW-156 • WD-28B, DW-157	<u>Room 16</u> Ensured DW-156 was OPEN **CUE: DW-156 stem is as you see it.** [SAT] [UNSAT]
7	**<u>NOTE</u>** Normal Moisture Separator Tank level, relative to the pump casing, is above the casing bottom and below the pump rotor centerline (C_L)	Applicant read note [SAT] [UNSAT]

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

STEP	ELEMENT	STANDARD
	Alternate Path	
**8 (4.b)	IF Moisture Separator Tank is above the pump rotor centerline, drain the tank: • WD-28A, WD-216 • WD-28B, WD-217	<u>Room 16</u> Checked Moisture Separator Tank Level **CUE: Water level is at second set of nuts from top on sightglass. (above the pump rotor centerline)** a. Opened WD-216 (counter-clockwise) b. Stem rises until resistance felt. b. **CUE: Water level is below pump rotor centerline** c. Closed WD-216 (clockwise) [SAT] [UNSAT] **CUE: stem lowers until resistance felt**
	<u>NOTE</u> Reference drawing file numbers 41162, 19745 and 19954	Read note before step 4C referencing drawing. [SAT] [UNSAT]

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

STEP	ELEMENT	STANDARD
9 (4.c)	IF Moisture Separator Tank level is below the casing bottom, fill by performing the following steps:	<u>Room 16</u> Checked Moisture Separator Tank Level **CUE: Water level is above the casing bottom.** Marked step N/A [SAT] [UNSAT]
10 (5)	If running one or more Waste Gas Compressors without CCW cooling water, station an Operator to ensure seal water temperature does not exceed 150 F. • TI/WD-28A, Waste Gas Compressor WD-28A Seal Water Temperature Indicator • TI/WD-28B, Waste Gas Compressor WD-28B Seal Water Temperature Indicator	Determines the CCW is available to the Waste Gas Compressor (Initial Conditions) and marks step N/A [SAT] [UNSAT]
11 (6)	IF AI-110 is operable, THEN perform the following:	Determined AI-110 is not operable (Initial Condition) and Marked step as N/A. [SAT] [UNSAT]
12	**<u>CAUTION</u>** H2 and O2 Concentrations in the WGDT must not exceed 3%.	Applicant read caution [SAT] [UNSAT]

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

STEP	ELEMENT	STANDARD
**13 (7.a)	Commence Waste Gas Transfer by performing the following steps: a. Start the selected Waste Gas Compressor: • WD-28A • WD-28B	AI-100 **Note: if power is off, then cue, GREEN light is ON.** WD-28A control switch to HAND RED light ON GREEN light OFF **Cue:You hear compressor noise.** [SAT] [UNSAT]
14 (7.b)	Monitor the following: • H2 and O2 • WGDT Pressure (PI-517) • Vent Header Pressure (PI-589)	**Examiner Note: H_2 and O_2 concentrations cannot be monitored with AI-110 inoperable.** AI-100 Monitored WGDT and Vent Header Pressures **PI-517 Pressure starts at 50 psig and rising** **PI-589 pressure 2 psig and slowly decreasing** [SAT] [UNSAT]
15	**NOTE** AI-110 HI H2 and O2 CONCENTRATION (AI-100, A-50, B-4) will be in alarm (AI-100) when H2 and O2 Concentrations exceed 3%.	Candidate read note [SAT] [UNSAT]

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

STEP	ELEMENT	STANDARD
16 (8)	IF H_2 and O_2 Concentrations exceed 3%, THEN secure the Waste Gas Transfer by performing the following steps:	**Examiner Note: H_2 and O_2 concentrations cannot be monitored with AI-110 inoperable.** Mark step N/A
17 (9)	If running a Waste Gas Compressor without CCW cooling water and seal water temperature reaches 150°F, stop the Waste Gas Compressor.	Determines the CCW is available to the Waste Gas Compressor (Initial Conditions) and marks step N/A [SAT] [UNSAT]
18	**<u>NOTE</u>** Waste Gas Compressors automatically shutdown on a Low Suction Pressure of approximately 0.5 psig. **<u>CAUTION</u>** The Vent Header should not be pumped down beyond atmospheric pressure. Placing a vacuum on the vent header could cause damage to the system and/or system components. This header was not designed to be under a vacuum.	Candidate read note and caution [SAT] [UNSAT]
		CUE: WGDT (PI-517) = 50 psig Vent Header(PI-526 or PI-589) = 1.0 psig NOTE: PI-526 is in room 16 PI-589 is on AI-100 in AI-100 room

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

STEP	ELEMENT	STANDARD
**19 (10)	WHEN the Vent Header pressure is approximately 1.0 psig (PI-526), In Service WGDT pressure reaches full capacity (95-100 psig), or Degassing Operations are completed, or Vent Header is at desired pressure below 1.0 psig (PI-526), THEN stop the selected Waste Gas Compressor: • WD-28A • WD-28B	<u>AI-100</u> WD-28A control switch to OFF and GREEN light ON [SAT] [UNSAT] **CUE: GREEN light ON, RED light OFF. You hear compressor stop.**
20 (11)	IF AI-110 is operable, THEN 5 minutes after the Waste Gas Transfer is secured.	Determined AI-110 is inoperable. Marked step as N/A. [SAT] [UNSAT]
22 (12)	IF AI-110 is inoperable, THEN notify the following: Shift Chemist to obtain grab samples.	**CUE: Shift Chemist Acknowledges.** [SAT] [UNSAT]
22 (12)	Shift Manager to review Technical Specification 2.9.	**CUE: Shift Manager Notified** [SAT] [UNSAT]
		CUE: JPM Complete

JPM No: P-3 Rev 3

JPM Title: Waste Gas Transfer from the Vent Header to the Gas Decay Tank

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Termination Criteria: **Waste gas has been transferred from the Vent Header to the in-service gas decay tank and the Waste Gas Compressor has been secured.**

JPM No: P-3 Rev 3

INITIAL CONDITIONS:	**Vent header pressure is at 2 psig. CCW cooling water is lined up and providing cooling to WD-28A, "A" Waste Gas Compressor. The pressure of the in-service Waste Gas Decay Tank, WD-29B, is 45 psig. AI-110 is inoperable. The Shift Chemist is on standby to take samples when notified. PI-686 is out of service.**

INITIATING CUE:	**You are directed to pump the vent header to the in service gas decay tank using WD-28A until vent header pressure has been reduced to 1.0 psig using OI-WDG-1, Attachment 3. All prerequisites are met.**

Panel: **CB-1/2/3**	Annunciator: **A4**	Window: **A-2**

PRESSURIZER POWER OPERATED RELIEF VALVES
DISCHARGE TAILPIPE TEMPERATURE HIGH

Page 1 of 2

SAFETY RELATED

**PRESSURIZER
PWR OPERATED
RELIEF VALVE
DISCH TEMP HI**

Tech Spec References: 2.1.4, 2.15

Initiating Device TIA-134 Setpoint >130°F Power AI-42A

OPERATOR ACTIONS

1. Check the Power Operated Relief Valves Tailpipe Temperature (TIA-134, CB-3).

2. IF Temperature is High, THEN perform the following:

   2.1 Check the Containment Temperature (T887, T888, T889, T890, ERF).

   2.1.1 IF Containment Temperature is greater than 120°F, THEN provide additional cooling to the Containment.

   2.2 Check the VCT Level Recorder for decreasing Level (YR-4100, CB-2).

   2.3 Monitor Pressurizer Quench Tank.

   2.3.1 IF temperature (TIA-133, CB-3) approaches 120°F, THEN perform OI-RC-6 Attachment 5, Quench Tank Temperature Control Following Safety or Relief Valve Discharge.

(continue)

PROBABLE CAUSES

- Power Operated Relief Valve seat leakage
- Containment Temperature high
- Instrument malfunction

REFERENCES

136B3081 Sh 20 06244	161F561 Sh 2 09477	161F561 Sh 14 09496
EM-134 00804	E-23866-210-110 10475	IC-ST-RC-0029

Panel: **CB-1/2/3**	Annunciator: **A4**	Window: **A-2**

PRESSURIZER POWER OPERATED RELIEF VALVES
DISCHARGE TAILPIPE TEMPERATURE HIGH

SAFETY RELATED

OPERATOR ACTIONS (continued)

2.4 Perform RCS Leak Rate Test OP-ST-RC-3001.

2.4.1 IF RCS Leakage is indicated, THEN close the PORV Block Valves one at a time AND monitor Tailpipe Temperature for decrease.

PCV-102-1	HCV-151
PCV-102-2	HCV-150

3. IF TIA-134 remains high AND no leakage from the RCS is indicated, THEN notify I&C to check the function of the instrument.

Panel: **CB-1/2/3**	Annunciator: **A6**	Window: **E-5**

LOSS OF POWER TO HCV-151, PZR
PORV PCV-102-1 BLOCK VALVE

SAFETY RELATED

HCV-151
TROUBLE

Tech Spec References: 2.1.6

Initiating Device 74/HCV-151 Setpoint UNDERVOLTAGE Power MCC-4A1

OPERATOR ACTIONS

1. Check the indicating lights HCV-151 (CB-3).

2. IF the valve indicating lights are off, THEN dispatch an Operator to check the valve breaker closed (MCC-4A1, Breaker C05).

   2.1 IF breaker is tripped, THEN notify Electrical Maintenance of valve motor fault.

   2.2 IF breaker is closed, THEN notify Electrical Maintenance to check the Control Power Fuses.

   2.3 Ensure the requirements of Technical Specification 2.1.6 are met.

3. IF the breaker is closed, THEN reset breaker overloads.

   3.1 Ensure the Overload Bypass Switch is in the NORMAL position.

   3.2 IF the annunciator is still in alarm, THEN notify Electrical Maintenance.

PROBABLE CAUSES

- Overcurrent or overload on the breaker for HCV-151

REFERENCES

136B3081 Sh 35 06259 11405-E-51 41445

Attachment 5 - MANUAL to AUTOMATIC Transfer for the Selected Channel

PREREQUISITES (✓) INITIALS

1. Procedure Revision Verification

Revision Number 17 Date: today

PROCEDURE

1. Note Output Meter reading and mark with moveable slide marker.

- PC-103X, Pressurizer Press Controller
- PC-103Y, Pressurizer Press Controller

NOTE

The following setpoint adjustment is made such that any deviation which may exist between manual and automatic output will drive controller output in the direction of proportional heaters.

2. Adjust SET pushbuttons such that Setpoint Meter (Blue) indication is slightly greater than Process Meter (Red) indication.

- PC-103X, Pressurizer Press Controller
- PC-103Y, Pressurizer Press Controller

Attachment 5 - MANUAL to AUTOMATIC Transfer for the Selected Channel

PROCEDURE (continued)

NOTE

Immediately following the transfer from Manual to Auto, the output meter will deflect in the heater direction. This change in output will occur linearly over approximately a 10 second period.

3. Place controller in automatic by pressing the A push-button and monitor the output meter for change.

    - PC-103X, Pressurizer Press Controller ___
    - PC-103Y, Pressurizer Press Controller ___ ______

NOTES

1. Left deflection on the meter will require a lowering of the setpoint, and right deflection on meter will require a raise in the setpoint, for compensation. This adjustment will take approximately 10 seconds.
2. At the final desired setpoint, it is normal for a slight offset to exist between Process Meter and Setpoint Meter indications.

4. Use SET pushbuttons and make small setpoint adjustments as necessary to return Output Meter reading to original position, indicated by the moveable slide marker.

    - PC-103X, Pressurizer Press Controller ___
    - PC-103Y, Pressurizer Press Controller ___ ______

Completed by______________________________ Date/Time______/____

JOB PERFORMANCE MEASURE

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

Location: Simulator

Approximate Time: 20 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 010000 A2.03 RO IMP: 4.1 SRO IMP: 4.2
Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: PORV failures.

Procedures: OI-RC-7, Attachment 5, “MANUAL to AUTOMATIC Transfer for the Selected Channel,” Rev 17
ARP-CB-1,2,3/A4, A-2
ARP-CB-1,2,3/A6, E-5

Other (tech specs, etc)

Handout(s): OI-RC-7, Attachment 5, “MANUAL to AUTOMATIC Transfer for the Selected Channel,” Rev 17

Task List#: 1314

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: Jerry Koske Date: 3/17/2012

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: IC# 106

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

TASK STANDARD: **The Candidate transferred PC-103Y to automatic mode in accordance with OI-RC-7, Attachment 5. The candidate responded to a PORV PCV-102-1 leak by attempting to close block valve HCV-151. When an overload occurred on the breaker for HCV-151, the Candidate directed the Building Operator to reset the overload trip. The Candidate than ensured HCV-151 closed and isolated the leaking PORV.**

INITIAL CONDITIONS: **The plant is operating at full power. Pressurizer Pressure Controller PC-103 Y is in manual for I&C testing. I&C testing is complete.**

INITIATING CUE: **You are directed to transfer PC-103Y to Automatic using OI-RC-7, Attachment 5. All prerequisites are met.**

Critical Steps shown in gray and **

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

STEP	ELEMENT	PERFORMANCE STANDARD
1 (1)	Note Output Meter reading and mark with moveable slide marker. • PC-103X, Pressurizer Press Controller • PC-103Y, Pressurizer Press Controller	CB-1,2,3 Positioned PC-103Y movable slide meter to match output meter reading [SAT] [UNSAT]
2	**Note:** The following setpoint adjustment is made such that any deviation which may exist between manual and automatic output will drive controller output in the direction of proportional heaters.	Read Note [SAT] [UNSAT]
3 (2)	Adjust SET pushbuttons such that Setpoint Meter (Blue) indication is slightly greater than Process Meter (Red) Indication. • PC-103X, Pressurizer Press Controller • PC-103Y, Pressurizer Press Controller	CB-1,2,3 Used PC-103Y SET pushbuttons to adjust Blue indication slightly greater than Red indication [SAT] [UNSAT]
	Note: Immediately following the transfer from Manual to Auto, the output meter will deflect in the heater direction. This change in output will occur linearly over approximately a 10 second period.	Read Note [SAT] [UNSAT]

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

STEP	ELEMENT	PERFORMANCE STANDARD
**4 (3)	Place controller in automatic by pressing the A push-button and monitor the output meter for change. • PC-103X, Pressurizer Press Controller • PC-103Y, Pressurizer Press Controller	<u>CB-1,2,3</u> Pressed the PC-103Y "A" pushbutton and monitored the output meter. [SAT] [UNSAT]
5	**<u>Notes:</u>** 1. Left deflection on the meter will require a lowering of the setpoint, and right deflection on meter will require a raise in the setpoint, for compensation. This adjustment will take approximately 10 seconds. 2. At the final desired setpoint, it is normal for a slight offset to exist between Process Meter and Setpoint Meter indications.	Read the Notes [SAT] [UNSAT]
6 (4)	Use SET pushbuttons and make small setpoint adjustments as necessary to return Output Meter reading to original position, indicated by the movable slide marker. • PC-103X, Pressurizer Press Controller • PC-103Y, Pressurizer Press Controller	<u>CB-1,2,3</u> Adjusted PC-103Y SET pushbuttons as required to return output meter to position indicated by movable slide marker. [SAT] [UNSAT]
		EXAMINER: Provide cue to simulator operator to insert PCV-102-1 malfunction.

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

STEP	ELEMENT	PERFORMANCE STANDARD
Alternate Path Begins		
7	"PRESSURIZER PWR OPERATED RELIEF VALVE DISCH TEMP HI" alarm	Entered ARP-CB-1,2,3/A4 and turned to Window A-2 [SAT] [UNSAT]
8 (1)	Check the Power Operated Relief Valves Tailpipe Temperature (TIA-134, CB-3)	<u>CB-1,2,3</u> Determined that temperature indicated by TIA-134 has risen. [SAT] [UNSAT]
9 (2, 2.1, 2.1.1)	If Temperature is High, THEN Perform the following: Check the Containment Temperature (T887, T888, T889,T890, ERF) IF Containment Temperature is greater than 120°F, THEN provide additional cooling to the Containment.	<u>ERF Computer</u> Used ERF Computer and determined that Containment temperature was below 120°F [SAT] [UNSAT]
10 (2.2)	Check the VCT Level Recorder for decreasing Level (YR-4100, CB-2)	<u>CB-1,2,3</u> Checked VCT level recorder. May have determined that level was decreasing slowly. [SAT] [UNSAT]

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

STEP	ELEMENT	PERFORMANCE STANDARD
11 (2.3, 2.3.1)	Monitor Pressurizer Quench Tank IF temperature (TIA-133, CB-3) approaches 120°F, THEN perform OI-RC-6 Attachment 5, Quench Tank Temperature Control Following Safety or Relief Valve Discharge.	<u>CB-1,2,3</u> Monitored Quench Tank Temperature and Level. May have determined that pressure and level were slowly increasing. Determined that temperature was below 120°F. [SAT] [UNSAT]
12 (2.4)	Perform RCS Leak Rate Test OP-ST-RC-3001	**Examiner CUE: RCS leak rate test indicates 4 gpm leakage**
**13 (2.4.1)	IF RCS Leakage is indicated, THEN close the PORV Block Valves one at a time AND monitor Tailpipe Temperature for decrease.	<u>CB-1,2,3</u> Attempted to close HCV-151 by placing Control Switch in the CLOSE Position [SAT] [UNSAT]
		NOTE: HCV-151 Breaker overload tripped when Candidate attempted to close the block valve.
14	"HCV-151 TROUBLE" Alarm	Entered ARP-CB-1,2,3/A6 and turned to Window E-5 [SAT] [UNSAT]
15 (1)	Check the indicating lights HCV-151	<u>CB-1,2,3</u> Determined that valve indicating lights are off. [SAT] [UNSAT]

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

STEP	ELEMENT	PERFORMANCE STANDARD
16 (2)	IF the valve indicating lights are off, THEN dispatch an Operator to check the valve breaker closed (MCC-4A1, Breaker C05)	Dispatched Building Operator to MCC-4A1, Breaker C05 to check if the valve breaker is closed. [SAT] [UNSAT]
		Examiner Cue: Water Plant Operator reports breaker is closed. Overload trip has occurred.
17 (2.1)	If breaker is tripped, THEN notify Electrical Maintenance of valve motor fault.	Determined step N/A because breaker did not trip. [SAT] [UNSAT]
18 (2.2)	If breaker is closed, THEN notify Electrical Maintenance to check the Control Power Fuses.	Notified Electrical Maintenance to check the Control Power Fuses. [SAT] [UNSAT]
		Examiner Cue: Electrical Maintenance reports Control Power fuses are good.
19 (2.3)	Ensure the requirements of Technical Specification 2.1.6 are met.	**Examiner Cue: The CRS is addressing the Technical Specification.**
20 (3., 3.1)	If the breaker is closed, THEN reset breaker overloads. Ensure the Overload Bypass Switch is in the NORMAL position.	Directed Building Operator to reset breaker overloads on MCC-4A1, Breaker C05 and ensure the Overload Bypass Switch is in the Normal position [SAT] [UNSAT]

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

STEP	ELEMENT	PERFORMANCE STANDARD
		NOTE: The "HCV-151 TROUBLE" alarm will reset.
		Examiner Cue: Building Operator reports breaker overloads are reset and overload bypass switch is in the Normal position.
21 (3.2)	IF the annunciator is still in alarm, THEN notify Electrical Maintenance.	CB-1,2,3 Determined annunciator was not in alarm. [SAT] [UNSAT]
		NOTE: HCV-151 will close when overloads are reset unless the HCV-151 switch was returned to the open position.
**22 (2.4.1)	IF RCS Leakage is indicated, THEN close the PORV Block Valves one at a time	**This step in NOT critical if the HCV-151 switch was left in the Close position.** CB-1,2,3. Closed HCV-151 by placing Control Switch in the CLOSE Position, Green Light ON [SAT] [UNSAT]
23 (2.4.1)	AND monitor Tailpipe Temperature for decrease.	CB-1,2,3 Monitored TIA-134 and determined that tailpipe temperature was decreasing. [SAT] [UNSAT]

JPM No: S-1 Rev 3

JPM Title: Swap Pressurizer Pressure Mode from Manual to Automatic

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Termination Criteria: PC-103Y is controlling in Automatic and HCV-151 is closed isolating PORV PCV-102-1.

JPM No: S-1 Rev 3

INITIAL CONDITIONS:	**The plant is operating at full power. Pressurizer Pressure Controller PC-103 Y is in manual for I&C testing. I&C testing is complete.**

INITIATING CUE:	**You are directed to transfer PC-103Y to Automatic using OI-RC-7, Attachment 5. All prerequisites are met.**

JOB PERFORMANCE MEASURE

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

Location: Simulator

Approximate Time: 15 minutes Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 006000 A3.03 RO IMP: 4.1 SRO IMP:4.1
Ability to monitor automatic operation of the ECCS, including: ESFAS-operated valves.

Procedures: EOP/AOP Floating Step W, Rev 3
EOP/AOP Attachment 3
Other (tech specs, etc)

Handout(s): EOP/AOP Floating Step W, "ENFGINEERED SAFEGUARDS ACTUATION VERIFICATION."

Task List#: 0334

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: Jerry Koske Date: 3/17/2012

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: IC-105 Event File: Close HPSI, Fail 86/B PPLS

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

TASK STANDARD:	**The Candidate verified Engineered Safeguards Actuation in accordance with EOP/AOP Floating Step W. During this verification, the Candidate determined that a PPLS Relay failed to actuate and manually initiated PPLS. The Candidate also determined that SI flow was inadequate per EOP/AOP Attachment 3 and took action to restore adequate flow by opening the HPSI Injection Valves.**
INITIAL CONDITIONS:	**The plant was operating at full power when a reactor trip and safeguards actuation occurred.**
INITIATING CUE:	**The CRS directs you to verify Engineered Safeguards Actuation using EOP/AOP Attachment W.**

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1 (1)	**IF** PPLS is blocked, **THEN** GO TO Step 4.	Verified PPLS was NOT blocked by: <u>CB-1,2,3</u> Verified the following annunciators are NOT in alarm: • **PPLS "A" BLOCKED** (CB-1/2/3, A4, E-5) • **PPLS "B" BLOCKED** (CB-1/2/3, A4, E-6) AND/OR <u>AI-30A/B</u> Verified the following annunciators are NOT in alarm: • **PPLS-A BLOCKED** (AI-30A, A33-1, C-1) • **PPLS-B1 BLOCKED** (AI-30A, A33-2, C-1) • **PPLS-B BLOCKED** (AI-30B, A34-1, C-7) • **PPLS-A1 BLOCKED** (AI-30B, A34-2, C-4) [SAT] [UNSAT]
2 (2)	**IF ALL** of the following exists, • RCS pressure less than 1600 psia • Containment pressure greater than 5 psig • At least one S/G pressure less than or equal to 500 psia	Determined that all of the listed conditions are NOT met because pressure in both S/Gs is greater than 500 psia. Went to step 3. [SAT] [UNSAT]

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

STEP	ELEMENT	STANDARD
3 (3)	**IF** RCS pressure is less than or equal to 1600 psia, **THEN** verify Engineered Safeguards are actuated by performing the following steps: Verify **ALL** of the following PPLS relays have tripped: • 86A/PPLS • 86B1/PPLS • 86B/PPLS • 86A1/PPLS	AI-30A/B Checked the status of each of the listed relays. Determined that 86B/PPLS did not actuate [SAT] [UNSAT]
Next Step is Alternate Path		
**4 (3.a.1)	IF any of the PPLS relays have NOT tripped, THEN manually initiate using the PPLS Test Switches	AI-30B • Removed key from key holder • Inserted it into the B PPLS Test Switch • Turned key clockwise • Verified 86/B PPLS relay actuated. [SAT] [UNSAT]
5 (3.b)	Ensure CIAS has initiated as indicated by **ALL** of the following CIAS relays being tripped: • 86A/CIAS • 86B1/CIAS • 86B/CIAS • 86A1/CIAS	AI-30A/B Verified that each of the listed relays was in the TRIPPED position with its Amber light OFF [SAT] [UNSAT]

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

STEP	ELEMENT	STANDARD
6 (3.c)	Ensure VIAS has initiated as indicated by **ALL** of the following VIAS relays being tripped: • 86A/VIAS • 86B1/VIAS • 86B/VIAS • 86A1/VIAS	<u>AI-30A/B</u> Verified that each of the listed relays was in the TRIPPED position with its Amber light OFF [SAT] [UNSAT]
7 (3.d)	Ensure Emergency Boration is in progress.	Verified Emergency Boration in progress by: <u>CB-4</u> Ensured the following valves were open (Red light ON) • HCV-268 • HCV-265 • HCV-258 Ensured the following pumps are running: • CH-4A • CH-4B <u>CB-1,2,3</u> Ensured the following pumps are running: • CH-1A • CH-1B • CH-1C Ensured the following valves are closed: • LCV-218-2 • LCV-218-3 <u>CB-4</u> Ensured the following valve are closed: • HCV-257 • HCV-264 [SAT] [UNSAT]

JPM No: S2 Rev 3

JPM Title: Engineered Safeguards Actuation Verification

STEP	ELEMENT	STANDARD
Next step is alternate path		
**8 (3.e)	Ensure SI flow is acceptable PER Attachment 3, Safety Injection Flow vs. Pressurizer Pressure.	<u>AI-30A/B or ERF Computer</u> Determined that flow was inadequate due to HPSI injection valves being closed. Opened the HPSI Injection Valves as required by turning switches clockwise until adequate flow was established: • HCV-311 • HCV-312 • HCV-314 • HCV-315 • HCV-317 • HCV-318 • HCV-320 • HCV-321 [SAT] [UNSAT]
		Examiner Cue: JPM Complete

Termination Criteria: Candidate has completed EOP/AOP Floating Step W through step 3 and restored adequate SI flow.

JPM No: S2 Rev 3

INITIAL CONDITIONS:	**The plant was operating at full power when a reactor trip and safeguards actuation occurred.**

INITIATING CUE:	**The CRS directs you to verify Engineered Safeguards Actuation using EOP/AOP Attachment W.**

JOB PERFORMANCE MEASURE

JPM No: JPM S-3 Rev 3

JPM Title: Place a Containment Cooling Unit in Service

Location: Simulator

Approximate Time: 10 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 022000 A4.01 (RO 3.6 / SRO 3.6):
Ability to manually operate and/or monitor in the control room:
CCS Fans

Procedures: OI-VA-1, Attachment 2 Rev 79
Other (tech specs, etc)

Handout(s): OI-VA-1, Attachment 2, “Containment Cooling Operation VA-7C & VA-7D”

Task List#: 0718

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ________________________________ Date: ____________

JPM No: JPM S-3 Rev 3

JPM Title: Place a Containment Cooling Unit in Service

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: Run in parallel to JPM S8, IC# 107

JPM No: JPM S-3 Rev 3

JPM Title: Place a Containment Cooling Unit in Service

TASK STANDARD: **The Applicant initiated CCW flow to Containment Cooling Coil, VA-8A and started Containment Air Cooling Fan, VA-7C.**

INITIAL CONDITIONS: **The plant is in hot shutdown following a normal plant shutdown using OP-3A.**

INITIATING CUE: **You are directed to place Containment Air Cooling Fan, VA-7C, and Containment Cooling Coil, VA-8A, in service per OI-VA-1, Attachment 2.**

All prerequisites are met.

JPM No: JPM S-3 Rev 3

JPM Title: Place a Containment Cooling Unit in Service

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1	**CAUTION** During Power Operations, either VA-3A and VA-7C OR VA-38 and VA-7D must be maintained operable. (SAO 07-003 and CR 2007-3052)	Applicant read caution [SAT] [UNSAT]
**2 (1.a.1)	IF VA-7C, Cntmt Vent Fan, is to be started, THEN perform the following: a. IF Containment Cooling is desired, THEN initiate CCW to VA-8A as follows: 1) Momentarily place HCV-402B/D, Cntmt Clg Coil VA-8A AC Vlvs Control SW to OPEN.	CB-1,2,3 Momentarily place HCV-402B/D in OPEN. Verify RED lights lit for both valves. [SAT] [UNSAT]
3 (1.a.2)	Ensure HCV-402C, Cntmt Clg Coil VA-8A Outlt Isol Vlv Cntrlr is closed.	CB-1,2,3 Ensure controller POT in closed position (100% output), GREEN light ON [SAT] [UNSAT]
**4 (1.a.3)	Momentarily place HCV-402NC, Cntmt Clg Coil VA-8A Isol Vlvs Control SW to CIRC.	CB-1,2,3 Momentarily place HCV-402A/C in CIRC position and release HCV-402A RED light ON [SAT] [UNSAT]

JPM No: JPM S-3 Rev 3

JPM Title: Place a Containment Cooling Unit in Service

STEP	ELEMENT	STANDARD
**5 (1.a.4)	Throttle open HCV-402C maintaining PI-499, CCW Discharge Header Pressure, greater than or equal to 70 psig.	CB-1,2,3 Adjust POT for HCV-402C toward OPEN position. ENSURE pressure on PI-499 does not go below 70 psig. [SAT] [UNSAT]
6 (1.a.5)	Monitor the following parameters: • VA-8A Flow • VA-8A Temperature • CCW Discharge Header Press • CCW Discharge Header Temp	CB-1,2,3 • FI-418 • TIC-422 • PI-499 • TIC-2800 [SAT] [UNSAT]
7	**CAUTION** Running a fan for an extended period with the CCW isolated to the cooling coil can cause the water to heatup inside the coil and possibly lift or cause the reliefs to weep.	Applicant read caution [SAT] [UNSAT]
		Note: VA-7C low DP alarm expected next step
**8 (1.b)	Start VA-7C	AI-30A VA-7C CS to AFTER-START (Red flag), RED light lit [SAT] [UNSAT]

JPM No: JPM S-3 Rev 3

JPM Title: Place a Containment Cooling Unit in Service

STEP	ELEMENT	STANDARD
9 (1.b)	Monitor Parameters: • VA-7C amps • VA-7C DP • VA-7C cooling coil DP • VA-7C Outlet Temp	<u>AI-30A</u> • VA-7C ammeter <u>AI-44</u> Monitor: • PIC-702 • PI-710 • TI-719 [SAT] [UNSAT]

Termination Criteria: VA-7C is running and CCW is being supplied to VA-8A

JPM No: S-3 Rev 3

INITIAL CONDITIONS: **The plant is in hot shutdown following a normal plant shutdown using OP-3A.**

INITIATING CUE: **You are directed to place Containment Air Cooling Fan, VA-7C, and Containment Cooling Coil, VA-8A, in service per OI-VA-1, Attachment 2.**

All prerequisites are met.

JOB PERFORMANCE MEASURE

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

Location: Simulator

Approximate Time: 15 minutes Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A#
Procedures: OI-SC-1, Attachment 1, Rev 56
Other (tech specs, etc)

Handout(s): OI-SC-1, Attachment 1, "Initiation of Shutdown Cooling."

Task List#: 0320

Applicable Position(s):RO, SRO-I

Time Critical: No

Alternate Path: No

JPM Prepared by: _______________________________ Date: ____________

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: IC 109, Ensure TR-346 is Off.

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

TASK STANDARD:	**The Applicant initiated shutdown cooling using LPSI pump, SI-1A in accordance with OI-SC-1, Attachment 1. Established 1460-1540 gpm SDC flow rate as indicated by FIC-326.**

INITIAL CONDITIONS:	**The plant is shutdown. Fuel is in the reactor vessel. Current plant status meets requirements for initiating shutdown cooling. OI-SC-1 has been completed through Step 18 of Attachment 1 for shutdown cooling using LPSI pump, SI-1A. RCP's RC-3B and RC-3D are running.**

INITIATING CUE:	**Continue in OI-SC-1, Attachment 1, at Step 19 to initiate shutdown cooling using LPSI pump, SI-1A.**

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
**1 (OI-SC-1, Att. 1, Step 19.a)	IF initiating SDC with fuel in the vessel, THEN warm up the SDC piping by performing the following: a. Place HCV-341, Shtdn HT Exch Valve Flow Cntrlr Ovrd SW, Key Switch in MAN.	<u>CB-1,2,3</u> Placed HCV-341, Shutdown Heat Exchanger Valve Flow Controller Override Switch key switch in MAN position. [SAT] [UNSAT]
**2 (OI-SC-1, Att. 1, Step 19.b)	Throttle HCV-341 10% open.	<u>CB-1,2,3</u> Turned HCV-341 potentiometer clockwise until meter indicated approximately 10% open. [SAT] [UNSAT]
**3 (OI-SC-1, Att. 1, Step 19.c)	Place LPSI/Shtdn Clg Flow Cntrlr FCV-326 Override Switch in MAN.	<u>CB-1,2,3</u> Placed FCV-326 LPSI/Shutdown Cooling Flow Controller FCV-326 override switch in MAN. [SAT] [UNSAT]
**4 (OI-SC-1, Att. 1, Step 19.d)	Throttle FCV-326, SDC Flow Control Valve, 20% open (Controller output at 80%).	<u>CB-1,2,3</u> Throttled FCV-326 approximately 20% open. **NOTE: For FCV-326 to be 20% open, controller output must 80%)** [SAT] [UNSAT]

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

STEP	ELEMENT	STANDARD
**5 (OI-SC-1, Att. 1, Step 19.e)	Open HCV-347 (Shtdn Clg/Loop 2 Isolation Valve Outbd)	<u>CB-1,2,3</u> Opened HCV-347. Held HCV-347 Control Switch in the open position until fully open. RED light ON, GREEN light OFF **NOTE: Stroke time is approximately one minute.** [SAT] [UNSAT]
6	**<u>NOTE</u>** After placing HC-348 in the open position, SHUTDOWN COOLING FLOW HI-LO (CB-1,2,3, A2, D-2U) will be enabled and will be in alarm until flow is established.	Read Note. [SAT] [UNSAT]
**7 (OI-SC-1, Att. 1, Step 19.f)	Open HCV-348 (Shtdn Clg/Loop 2 Isolation Valve Inbd)	<u>CB-1,2,3</u> Opened HCV-348. Placed HCV-348 Control Switch in open position. Verified RED light ON and GREEN light OFF. [SAT] [UNSAT]
8	SHUTDOWN COOLING FLOW HI-LO (CB-1,2,3, A2, D-2U) Alarm	<u>CB-1,2,3</u> Acknowledged Alarm [SAT] [UNSAT]
9 (OI-SC-1, Att. 1, Step 19.g)	Vent the selected LPSI pump by opening the following valve(s) until full water flow is observed and then close the valve(s): SI-334, LPSI Pump Casing Vent Valve (SI-1A)	Directed AO to vent SI-1A [SAT] [UNSAT] **<u>CUE:</u> SI-1A has been vented. SI-334 is closed.**

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

STEP	ELEMENT	STANDARD
**10 (OI-SC-1, Att. 1, Step 19.h)	Start selected LPSI pump: SI-1A	CB-30A Started SI-1A. Placed CS in "After-Start" position. RED light ON, GREEN light OFF [SAT] [UNSAT]
11		CB-30A Verified SI-1A ammeter current increased to starting current and returned to normal current. [SAT] [UNSAT]
12	**NOTE** SDC System Heatup should take at least ten minutes	Read Note. [SAT] [UNSAT]
13 (OI-SC-1, Att. 1, Step 19.i)	Place TR-346 in service.	CB-10,11 Placed TR-346 in service. Pulled out recorder drawer and placed switch on left hand side of drawer in OFF. Pushed drawer back in. [SAT] [UNSAT]
14	**NOTE** Reclosing the LPSI Loop Injection Valve may be required to maintain the desired heatup rate.	Read Note. [SAT] [UNSAT]

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

STEP	ELEMENT	STANDARD
15 (OI-SC-1, Att. 1, Step 19.j)	Crack open a LPSI Loop Injection Valve to a loop with a running RCP to obtain a gradual heatup rate (approximately 20°F /min) as indicated on TR-346.	AI-30A/B Cracked open HCV-329 or HCV-333. Verified gradual heatup rate obtained. [SAT] [UNSAT]
16	**NOTE** More than two LPSI Loop Injection Valves may be opened for testing, maintenance or if two SDC pumps are running.	Read Note. [SAT] [UNSAT]
		Examiner Cue: Temperature has stabilized
**17 (OI-SC-1, Att. 1, Step 19.k)	When TR-346 temperature stabilizes, THEN open any two LPSI loop injection valves	AI-30A/B Opened two of the following LPSI loop injection valves: • HCV-327 • HCV-329 • HCV-331 • HCV-333 [SAT] [UNSAT]
**18 (OI-SC-1, Att. 1, Step 20)	Throttle FCV-326 to obtain 1500 gpm on FIC-326	Verified 1460-1540 gpm flow through FIC-326 or throttled as required to obtain 1460-1540 gpm as indicated on FIC-326. [SAT] [UNSAT]
**19 (OI-SC-1, Att. 1, Step 21)	Place FCV-326 in AUTOMATIC and verify 1500 gpm flow is maintained	Placed FCV-326 in automatic. Verified 1460-1540 gpm as indicated on FIC-326. [SAT] [UNSAT]

JPM No: S-4 Rev. 3

JPM Title: Initiation of Shutdown Cooling

Termination Criteria: **Shutdown cooling initiated using LPSI pump, SI-1A with FCV-326 in automatic and 1460-1540 gpm flow through FIC-326.**

JPM No: S-4 Rev 3

INITIAL CONDITIONS:	**The plant is shutdown. Fuel is in the reactor vessel. Current plant status meets requirements for initiating shutdown cooling. OI-SC-1 has been completed through Step 18 of Attachment 1 for shutdown cooling using LPSI pump, SI-1A. RCP's RC-3B and RC-3D are running.**

INITIATING CUE:	**Continue in OI-SC-1, Attachment 1, at Step 19 to initiate shutdown cooling using LPSI pump, SI-1A.**

Fort Calhoun Station
Unit No. 1

OI-SC-1

OPERATING INSTRUCTION

SHUTDOWN COOLING INITIATION

Change No.	EC 54544, 54733
Reason for Change	Add guidance for HC-347 and HC-348 to be in override when Pressurizer manway is removed (EC 54544). Add venting instructions for vent valve SI-472 (EC 54733).
Requestor	C. Kuchta, N. Bretey
Preparer	K. Bessey
Issue Date	02-07-12 3:00pm

SHUTDOWN COOLING INITIATION

SAFETY RELATED

ATT PURPOSE | PAGE

PRECAUTIONS

1. Per Technical Specification 2.1.1(3), at least one RCP or one Shutdown Cooling Loop shall be in operation whenever fuel is in the Reactor, and RCS boron concentration is being changed.

2. Shutdown Cooling flow (nominally 1500 gpm on FIC-326) should be provided through the Reactor Core before stopping the last RCP.

3. The minimum Shutdown Cooling System flow rate shall be maintained greater than 1000 gpm per the most recent Boron Dilution Analysis.

4. The minimum pressure limitation for RCP operation per TDB-III.7.a OR TDB-III.7.d when going into Shutdown Cooling shall be observed.

5. Whenever a LPSI Pump is in operation, then a minimum pump flow of 200 gpm must exist at all times. This flow may be provided by minimum recirculation flow.

6. If while operating in the SDC mode either HCV-347 and/or HCV-348 were to inadvertently close, prompt operator action must be taken to either reopen the valve(s) or secure the operating SDC Pump(s).

7. Whenever RCS level is below the top of the Hot Leg, monitor level using LI-197 and LIS-119 or LI-199 and SDC pump parameters (pressure, flow, amps) to detect a loss of SDC pump suction due to vortexing or air binding of the SDC pump. **[AR 9369]**

8. Do not exceed a Pressurizer level of 60% actual. This provides a sufficient steam volume in the Pressurizer for insurges.

9. Loss of Shutdown Cooling, AOP-19, shall be entered if Shutdown Cooling is lost.

10. When RCS Level is below 1025.2' (less than 23' above the top of the core), two Shutdown Cooling loops shall be OPERABLE, and one Shutdown Cooling Loop shall be IN OPERATION. (Technical Specification 2.8.1(4))

PRECAUTIONS (continued)

11. When the RCS level is above 1025.2' (greater than 23' above the top of the core), one Shutdown Cooling Loop shall be IN OPERATION except as noted in Technical Specification 2.8.1(3).

12. With fuel in the Reactor and the RCS in a reduced inventory condition, (less than 1010' elevation) at least one off-site power source, both Diesel Generators and both vital electrical distribution trains must be available. **[AR 9368]**

13. Containment Spray Pumps are not available for Shutdown Cooling unless RCS Temperature is less than 120°F and the RCS is vented by an area greater than or equal to 47 in^2.

14. Maintain RCS temperature greater than 64°F per TR-346 inlet temperature (black pen), Head Bolt-Up Temperature, until the Reactor Vessel Head is de-tensioned.

15. To ensure the assumptions made in Shutdown Margin Calculations remain valid, maintain Shutdown Cooling Inlet Temperature above 54°F (TR-346) when fuel is in the core.

16. When RCS Level is below 1010' (Reduced Inventory Condition), no more than two LPSI Loop Injection Valves shall be open. This is to minimize SDC pump runout and reduce the likelihood of vortexing in the event FCV-326 fails open.

17. To prevent possible RCS overpressurization when the Reactor Vessel Head is installed and Shutdown Cooling is required to be operable, one of the following conditions shall be maintained:

    - A Steam Generator shall be available to remove decay heat with:

        1) No nozzle dams installed. **[AR 9361]**

        2) A Secondary side minimum water level of 63% narrow range. **[AR 9361]**

        3) U-tubes have not been drained or have been swept after filling.

    - The Pressurizer Manway is removed. **[AR 9361]**

    - PORVs operable per TS 2.1.6(4), and S/G Nozzle Dams not installed, and RCS not in reduced inventory condition (below 1010' elevation)

18. The Isolation Valves HCV-347, SHTDN CLG/Loop 2 Isolation Valve Outbd and HCV-348, SHTDN CLG/Loop 2 Isolation Valve Inbd shall be available when Shutdown Cooling is in operation. **[AR 9361]**

PRECAUTIONS (continued)

19. When SDC is required to be operable, the following shall be maintained: **[AR 9362]**

- The required number of Shutdown Cooling Loops with backup power sources
- One Containment Spray Pump with a backup power source, a flow path and a suction source in order to satisfy the minimum delivery requirements of 575 gpm of borated water to the Reactor Vessel, if needed, to maintain the core cool

> **NOTE**
>
> For RCS temperatures, T_c less than 270°F, one HPSI Pump may be made operable provided the flowrate is throttled to the equivalent of three Charging Pumps (120 gpm) and all three Charging Pumps are disabled.

- One HPSI Pump or two Charging Pumps with backup power sources, a flow path and a suction source. (This satisfies the minimum delivery requirements of 55 gpm borated water to the Reactor Vessel, if required, to maintain the core covered)

20. When fuel is in the Reactor, the RCS Level must remain above the Center Line of the Leg (1006.5') to ensure a suction for Shutdown Cooling. **[AR 9362]**

21. To prevent possible degradation to the motor windings, the following criteria should be observed for SI-1A and SI-1B:

- Allow the motor to come to a complete stop before starting.
- If the LPSI pump has been shutdown for at least one hour, two successive starts are allowed.
- If the LPSI pump has been at rated speed and has been shutdown less than one hour, only one start is allowed.
- These criteria should be disregarded if multiple LPSI pump starts are needed to either maintain plant Technical Specifications, respond to a plant emergency, or as directed by the Shift Manager.

22. For the purposes of fulfilling Shutdown Cooling requirements per Technical Specifications 2.1.1 or 2.8, Component Cooling Water or Raw Water Backup to the Low Pressure Safety Injection Pumps or Containment Spray Pumps is required. This does not apply to Safety Injection requirements in accordance with Technical Specification 2.3 and 2.4.

23. Reactivity should be monitored during and after any evolutions that change SDC or SDC Purification flows or temperatures when fuel is in the Reactor Vessel.

REFERENCES/COMMITMENT DOCUMENTS

1. Technical Specifications:

   - 2.1.1: Reactor Coolant System Operable Components
   - 2.1.2: Reactor Coolant System Heatup and Cooldown Rate
   - 2.4: Containment Cooling
   - 2.8: Refueling
   - 2.8.1 (3): Shutdown Cooling System - High Water Level
   - 2.8.1 (4): Shutdown Cooling System - Low Water Level
   - 3.2 Table 3-5, Item 23, P-T Limit Curve

2. Drawings

Drawings	File	Description
E-23866-210-130	44353	Safety Injection and Containment Spray
D-4768	45997	Simplified Flow Path Diagram

3. USAR:

   - Section 4.0: Reactor Coolant System
   - Section 7.4: Regulating Systems
   - Section 9.3: Shutdown Cooling
   - Section 14.3: Safety Analysis: Boron Dilution Incident

4. Technical Data Book:

   - Figure TDB-III.7.a, RCS Pressure and Temperature Limits
   - Figure TDB-III.7.d, RCS Pressure and Temperature Limits

5. Ongoing Commitments:

   - AR 9369, LIC-88-1106
   - AR 9362, LIC-88-1106
   - AR 9361, LIC-88-1106
   - AR 9368, LIC-88-1106

APPENDICES

Attachment 1 - Initiation of Shutdown Cooling

PREREQUISITES (✓) INITIALS

1. Procedure Revision Verification

   Revision No. 56 Date: 2/7/12 — JEK

2. RCS Temperature is less than 515°F. — JEK

3. Pressurizer Pressure is less than 1700 psia and PPLS is blocked. — JEK

4. IF Shutdown Cooling has been secured and maintenance has been performed on the Shutdown Cooling System,
   THEN perform OI-SC-1-CL-B. — N/A

   N/A
   Ind Verif

5. Shutdown Cooling Checklist OI-SC-1-CL-A has been performed and independently verified. — JEK

   IV
   Ind Verif

6. IF venting of Shutdown Cooling is desired,
   THEN perform OI-SC-1 Attachment 3. — N/A

Attachment 1 - Initiation of Shutdown Cooling

PREREQUISITES (continued) (✓) INITIALS

7. Component Cooling System is in operation and available to provide cooling to the Shutdown Cooling Heat Exchangers and the Low Pressure Safety Injection (LPSI) Pump Seals. EK

8. Perform applicable step based on Pressurizer Manway position.

   a. IF the Pressurizer Manway is installed, THEN the Shutdown Cooling Containment Isolation Valves, HCV-347/348, PZR Press PC-118A Auto Sig Override Sw HC-347/348 is in the NORMAL position with key inserted and ready for operation. ✓

   b. IF the Pressurizer Manway is removed, THEN the Shutdown Cooling Containment Isolation Valves, HCV-347/348, PZR Press PC-118A Auto Sig Override Sw HC-347/348 is in the OVERRIDE position with key inserted and ready for operation. EK

9. IF the Refueling Cavity is less than refueling level, THEN ensure the following components/flowpaths are available for adequate RCS makeup:

   - One Containment Spray Pump with a backup power source ✓
   - One HPSI Pump or two Charging Pumps with backup power sources ✓
   - Flowpaths to the RCS and suction flow path from the SIRWT and/or BAST ✓ EK

Attachment 1 - Initiation of Shutdown Cooling

PREREQUISITES (continued) (✓) INITIALS

10. IF the Refueling Cavity is less than refueling level,
THEN designate each make up flow path by performing the following:

a. Indicate the flowpath on FC-1291; Designated Make Up Flow Paths to the RCS and attach the form to the Control Room Shift Turnover Log. Flow Path shall include:

- Manual Valves
- Hand Control Valves
- Pumps

EK

b. Highlight the flow path on the Control Room "Simplified Flow Path Diagram" (D-4768 File No. 45997). EK

c. Place designated placards on equipment manipulated from the Control Room (Hand Control Switches etc.), indicated on FC-1291. EK

CAUTION

When the RCS is unvented (pressurized), operator action will be required to secure charging pumps in the event that purification flow is limited or lost. This is to prevent loss of Shutdown Cooling due to rapid increase of RCS pressure. With three charging pumps operation, as little as 1.1 minute is available prior to the loss of Shutdown Cooling.

11. A Dedicated Operator has been assigned to monitor the RCS pressure and shutdown the charging pump(s) as required prior to RCS pressure reaching 300 psia until the RCS is vented.

Dedicated Operator D O EK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (✓) INITIALS

NOTES

1. Definition of "Available": The status of a system, structure or component that is in service or can be placed in service within a reasonably short period of time (consistent with its intended function) and can be expected to perform the intended functional need.
2. Initially, both LPSI Pumps shall be aligned for SDC and three of the following power sources shall be available: 345KV, 161KV, DG-1, and DG-2.
3. When RCS Temperature is less than 120°F and vented by an area greater than or equal to 47 in^2, then a Containment Spray Pump may be used for SDC.
4. Steps 1 through 6 may be performed in any order.

1. Place placards for both LPSI Pumps to indicate they are operable (aligned) for SDC per Technical Specification 2.1.1 or 2.8. EK

2. Place placards on any three of the following AC power sources to indicate they are available as backup power sources for SDC Pumps required per Technical Specification 2.1.1. **[AR 9368]**

   - 345KV ✓
   - 161KV ✓
   - DG-1 and 4160 KV Bus 1A3 ✓
   - DG-2 and 4160 KV Bus 1A4 EK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

> **NOTE**
>
> IF CCW Low Flow Switches are inoperable, local Ultrasonic Flow Readings shall be taken and logged every four hours (refer to PMID-2560).

3. Verify SI-1A and SI-1B CCW flow switches (FC-2817 and 2818), are operable by performing the following:

   a. Momentarily close HCV-2808A/B, SI-1A Bearing Cooler CCW Valves, and verify **LPSI SI-1A BEARING COOLER NO FLOW** (CB-1,2,3, A1, A-3L) is in alarm. EK

   b. Open HCV-2808A/B and verify **LPSI SI-1A BEARING COOLER NO FLOW** (CB-1,2,3, A1, A-3L) clears. EK

   c. Momentarily close HCV-2809A/B, SI-1B Bearing Cooler CCW Valves, and verify **LPSI SI-1B BEARING COOLER NO FLOW** (CB-1,2,3, A1, B-4U) is in alarm. EK

   d. Open HCV-2809A/B and verify **LPSI SI-1B BEARING COOLER NO FLOW** (CB-1,2,3, A1, B-4U) clears. EK

4. Reverse the logic for HCV-347 and HCV-348 Trouble Alarms by completing the following:

> **NOTE**
>
> **HCV-347 TROUBLE** (CB-1, 2, 3, A6, E-7) should be in alarm.

   a. Unlock and place MCC-4C2-E01, HCV-347 Shutdown Cooling Loop Isolation Valve Breaker in ON (Breaker Located in Corridor 4). EK

   b. Pull Annunciator Card **HCV-347 TROUBLE** (CB-1,2,3, A6, E-7). EK

   c. Place Annunciator N.O./N.C. selector switch in the N.O. position. EM
   EM

   d. Reinstall Annunciator Card **HCV-347 TROUBLE** (CB-1,2,3, A6, E-7). EK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

4.

NOTE
HCV-348 TROUBLE (CB-1,2,3, A6, E-6) should be in alarm.

e. Unlock and place MCC-3B1-F04, HCV-348 Loop SDC Isolation Valve Breaker in ON. (Room 57 East). EK

f. Pull Annunciator Card **HCV-348** TROUBLE (CB-1,2,3, A6, E-6). EK

g. Place Annunciator N.O./N.C. **selector** switch in the N.O. position. EM
EM

h. Reinstall Annunciator Card **HCV-348 TROUBLE** (CB-1,2,3, A6, E-6). EK

5. Ensure HCV-344, Containment Spray Valve, and HCV-345, Containment Spray Valve, are closed by performing the following:

a. Place the following controllers in CLOSED:

- HIC-344, Cntmt Spray Vlv HCV-344 Controller (AI-30A) ✓
- HIC-345, Cntmt Spray Vlv HCV-345 Controller (AI-30B) ✓ EK

b. Place the following control switches in OVERRIDE:

- HC-344, Cntmt Spray Vlv HCV-344 Control Switch (AI-30A) ✓
- HC-345, Cntmt Spray Vlv HCV-345 Control Switch (AI-30B) ✓ EK

c. Verify the following are in alarm:

- **SPRAY VALVE HCV-344 HEADER ISOLATED** (AI-30A, A33-1, H-6) ✓
- **SPRAY VALVE HCV-345 HEADER ISOLATED** (AI-30B, A34-1, H-2) ✓ EK

d. Ensure the following valves are CLOSED:

- HCV-344, Containment Spray Valve (AI-30A) ✓
- HCV-345, Containment Spray Valve (AI-30B) ✓ EK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

NOTE

The following step disables the function of Pressure Switches, PS-484 and PS-485. Disabling these pressure switches prevents Shutdown Cooling Heat Exchanger CCW Outlet Valves HCV-484 and HCV-485 from cycling to a closed position on a loss of Instrument Air pressure.

6. Place the following Control Switches in OVERRIDE: (East end of Corridor 4)

   - HC-484, CCW Valve Press Switch PS-484 Manual Override Switch (JB-137A) ✓
   - HC-485, CCW Valve Press Switch PS-485 Manual Override Switch (JB-138A) ✓ EK

7. Ensure Pressurizer Pressure is less than 300 psia. EK

8. Ensure RCS Temperature is less than 350°F. EK

NOTES

1. TDB Figure TDB-III.7.d provides more detail to assist in a RCS cooldown.
2. Once the cooldown is started, OP-ST-RC-0008, RCS Heatup/Cooldown Rate, or the equivalent may be used to track the RCS cooldown rate.

CAUTIONS

1. If RCS pressure drops below the RCP minimum pressure limitation per TDB Figure TDB-III.7.d, the operating RCP shall be stopped.
2. If Pressurizer level drops to 32% actual (corrected for temperature) while initiating Shutdown Cooling, HCV-347 and HCV-348 shall be closed.

9. Place HCV-347, SHTDN CLG/LOOP 2 ISOLATION VALVE OUTBD, Key Switch in ON. EK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

10. A Dedicated Operator has been briefed to close HCV-347 or HCV-348 if any of the following indications exceed 300 psia:

- P-105
- P-115

Dedicated Operator D O
Name
JEK

11. Ensure RCS Pressure is below 300 psia as indicated:

- P-105
- P-115

✓ ✓ JEK

12. Place "PZR Press PC-118A Auto Sig Override Sw HC-347/348" to the OVERRIDE position. JEK

13. Open HCV-347 to allow piping between HCV-347 and HCV-348 to fill with borated water. JEK

14. Close HCV-347. JEK

15. Align selected LPSI Pump(s) for Shutdown Cooling as follows:

a. Ensure the selected LPSI Pump is secured:

- SI-1A
- SI-1B

✓ JEK

b. Close both SI Pump Minimum Recirculation Return to SIRWT Valves:

- HCV-385
- HCV-386

✓ ✓ JEK

c. Close both LPSI Pump Minimum Recirculation Stop Valves:

- SI-1A SI-132
- SI-1B SI-124

✓ ✓ JEK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

15.

d. Close both LPSI Pump Suction Valves:

- SI-1A HCV-2947
- SI-1B HCV-2937

✓ ✓ JEK

IV
Ind Verif

e. Handjack closed both LPSI Pump Suction Valves from the SIRWT:

- SI-1A HCV-2947
- SI-1B HCV-2937

✓ ✓ JEK

IV
Ind Verif

NOTE

The following steps will depressurize the LPSI Header.

16. Remove SI-18, LPSI Header Jockey Pump from service by completing the following:

a. Place HC-301, LPSI Header Jockey Pump SI-18 Control Switch in OFF. JEK

b. Close the following valves:

- SI-434, LPSI Header Jockey Pump SI-18 Discharge Valve
- SI-425, LPSI Header Jockey Pump SI-18 Suction Valve

✓ ✓ JEK

17. Open SI-186, Safety Injection Pumps SI-1A, 1B Shutdown Cooling Warm Up Isolation Valve. JEK

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

CAUTION

Maximum, flow rate is 650 gpm with no fuel in the Reactor Vessel, and the UGS installed with the ICI plate in the lowered position. With the ICI plate in the raised position, there is no flow restriction.

18. IF initiating SDC without fuel in the vessel,
THEN perform the following:

a. Place HCV-341, Shtdn HT Exch Valve Flow Cntrlr Ovrd SW, Key Switch in MAN. N/A

b. Close HCV-341. ____

c. Place LPSI/Shtdn Clg Flow Cntrlr FCV-326 Override Switch in MAN. ____

d. Throttle FCV-326, SDC Flow Control Valve, 20% open (Controller output at 80%). ____

e. Open HCV-347. ____

NOTE

After placing HC-348 in the open position, **SHUTDOWN COOLING FLOW HI-LO** (CB-1,2,3, A2, D-2U) will be enabled and will be in alarm until flow is established.

f. Open HCV-348. ____

g. Vent the selected LPSI pump by opening the following valve(s) until full water flow is observed and then close the valve(s):

- SI-334, LPSI Pump Casing Vent Valve (SI-1A) ___
- SI-372, LPSI Pump Casing Vent Valve (SI-1B) ___
- SI-335, LPSI Pump Casing Vent Valve (SI-1B) ___ ____

h. Start selected LPSI pump:

- SI-1A ___
- SI-1B ___ ____

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

18.
   i. Throttle open one or two LPSI Loop Injection Valves to obtain the desired flow rate. N/A

   j. Throttle FCV-326 to obtain the desired flow rate on FIC-326. ______

   k. Place FCV-326 in AUTOMATIC and verify flow is maintained. ______

   l. Fully open one or two LPSI Loop Injection Valves. ______

   m. Place TR-346 in service. ______

   n. GO TO Step 22. ______

NOTE

Heatup of the Shutdown Cooling System is necessary to reduce thermal shock to the system when hot Reactor Coolant flow is established.

19. IF initiating SDC with fuel in the vessel,
THEN warm up the SDC piping by performing the following:

   a. Place HCV-341, Shtdn HT Exch Valve Flow Cntrlr Ovrd SW, Key Switch in MAN. ______

   b. Throttle HCV-341 10% open. ______

   c. Place LPSI/Shtdn Clg Flow Cntrlr FCV-326 Override Switch in MAN. ______

   d. Throttle FCV-326, SDC Flow Control Valve, 20% open (Controller output at 80%). ______

   e. Open HCV-347. ______

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

NOTE

After placing HC-348 in the open position, **SHUTDOWN COOLING FLOW HI-LO** (CB-1,2,3, A2, D-2U) will be enabled and will be in alarm until flow is established.

19.

f. Open HCV-348. ______

g. Vent the selected LPSI pump by opening the following valve(s) until full water flow is observed and then close the valve(s):

- SI-334, LPSI Pump Casing Vent Valve (SI-1A) ___
- SI-372, LPSI Pump Casing Vent Valve (SI-1B) ___
- SI-335, LPSI Pump Casing Vent Valve (SI-1B) ___ ______

h. Start selected LPSI pump:

- SI-1A ___
- SI-1B ___ ______

NOTE

SDC System Heatup should take at least ten minutes.

i. Place TR-346 in service. ______

NOTE

Reclosing the LPSI Loop Injection Valve may be required to maintain the desired heatup rate.

j. Crack open a LPSI Loop Injection Valve to a loop with a running RCP to obtain a gradual heatup rate (approximately 20°F /min) as indicated on TR-346. ______

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

NOTE

More than two LPSI Loop Injection Valves may be opened for testing, maintenance or if two SDC pumps are running.

19.

k. WHEN TR-346 temperature stabilizes,
THEN open any two LPSI Loop Injection Valves. _______

20. Throttle FCV-326 to obtain 1500 gpm on FIC-326. _______

21. Place FCV-326 in AUTOMATIC and verify 1500 gpm flow is maintained. _______

NOTE

When T_c is 178°F or greater, then maximum RCS cooldown rate is 100°F/hr.
When T_c is less than 178°F, the maximum RCS cooldown rate is 50°F/hr.

22. Establish desired RCS cooldown rate by adjusting the following valves:

- HCV-484 ___
- HCV-485 ___
- HCV-341 ___ _______

NOTE

Monitor for expected temperature rise on T339 and/or T340 when flow is initially diverted through SDC Hx when adjusting HCV-341, HCV-484, and HCV-485.

23. The applicable ERF point is being monitored for the in service Shutdown Cooling Heat Exchanger(s).

- T339, SDC Htxr A Outlet Temperature ___
- T340, SDC Htxr B Outlet Temperature ___ _______

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

NOTES

1. The following step may be performed at any time when conditions are met.
2. PC-118A is located behind CB-1, second door under GM2, and is approximately eye level. When both red lights are out, the relays are reset.

24. IF ALL of the following criteria are met:

    - Pressurizer Manway is installed ___
    - PC-118A interlocks are reset ___
    - RCS pressure stable below the 300 psia close signal ___

    THEN return PZR Press PC-118A Auto Sig Override Sw HC-347/348 to the NORMAL position. ________

25. Release Dedicated Operator. ________

26. If desired, start additional CCW Pumps. ________

27. At the Shift Manager's discretion, place the second LPSI Pump in operation by performing the following steps:

    a. Start the second LPSI Pump:

       - SI-1A ___
       - SI-1B ___ ________

    b. Adjust FCV-326 Setpoint to 3000 gpm. ________

    c. Establish desired RCS cooldown rate by adjusting the following valves as necessary:

       - HCV-484 ___
       - HCV-485 ___
       - HCV-341 ___ ________

Attachment 1 - Initiation of Shutdown Cooling

PROCEDURE (continued) (✓) INITIALS

28. WHEN the desired RCS temperature is reached,
THEN adjust cooling to match decay heat and maintain the RCS at the desired temperature. ________

Completed by ____________________________ Date/Time ________/________

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

Location: Simulator

Approximate Time: 25 minutes Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 061000 A2.04 RO IMP:3.4 SRO IMP:3.8
Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: pump failure or improper operation.

Procedures: AOP-28, section 1, Rev 15

Other (tech specs, etc)

Handout(s): AOP-28, "AUXILLIARY FEEDWATER SYSTEM MALFUNCTIONS," section 1

Task List#: 0025

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: Jerry Koske Date: 3/18/2012

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: IC 108 This JPM is run in parallel with JPM S-6
VLV/AFW/SGN_YCV1045/0%,
FW-54 will not start

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

TASK STANDARD:	**The Applicant responded to a loss of feedwater by using AOP-28, Section 1, by attempting to start FW-10 and Tripping RCPs. Applicant established FW flow by Starting the “B” Main Feedwater Pump and adjusting FW Bypass Valves to restore flow to at least one Steam Generator.**
INITIAL CONDITIONS:	**The plant was being maintained in hot shutdown due to a chemistry hold. FW-54 was being used to feed the Steam Generators. When FW-54 tripped, FW-6 was started and used to feed the steam generators through the nozzles. FW-6 tripped 5 minutes ago.**
INITIATING CUE:	**You are directed to restore flow to the Steam Generators per AOP-28, Section 1.**

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
		Examiner Note: **Provide Applicant with a copy of AOP-28, Section 1**
1	**NOTES** Technical Specification 2.5, Steam and Feedwater System, discusses operating lomits associated with the AFW System.	Applicant read note. [SAT] [UNSAT] **Examiner Cue: If Applicant refers to TS, "The CRS will address Tech Spec requirements."**
**2 (1)	Start FW-10, Steam AFW Pump.	AI-65/66 Applicant attempted to open the following valves by placing the YCV-1045 Control Switch in OPEN position and verify RED light ON: • YCV-1045 • YCV-1045A • YCV-1045B [SAT] [UNSAT]
3 (1.1)	Start FW-54, Diesel AFW Pump	Applicant determined FW-54 was not available. [SAT] [UNSAT]
4 (2)	**IF** feedwater is restored, **THEN** GO TO Section 5.0, Exit Conditions.	Applicant determined that feedwater was NOT restored and did NOT exit procedure. [SAT] [UNSAT]

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

STEP	ELEMENT	STANDARD
5 (3)	**IF** the Reactor is critical, **THEN** initiate shutdown of the Reactor by performing the following:	Applicant determined that the reactor was NOT critical. [SAT] [UNSAT]
6 (4)	Stabilize RCS temperature by adjusting steaming rate.	<u>DCS</u> Applicant MAY adjust steam dump and bypass valve position. [SAT] [UNSAT]
**7 (5)	Trip all RCPs.	<u>CB-1,2,3</u> Applicant tripped all four RCPs by placing their Control Switches in the AFTER-TRIP position and verified no current on ammeter. [SAT] [UNSAT]
8 (6)	Ensure **ALL** of the Blowdown Isolation Valves are closed: • HCV-1388A • HCV-1388B • HCV-1387A • HCV-1387B	<u>CB-10/11</u> Applicant verified ALL of the listed valves were closed. Control Switches in the CLOSE position and verified Green Lights ON [SAT] [UNSAT]
9 (7)	Monitor the Floating Steps.	**EXAMINER CUE: Another Operator will monitor the floating steps**
10 (8)	IMPLEMENT the Emergency Plan	**EXAMINER CUE: The Shift Manager will implement the Emergency Plan**

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

STEP	ELEMENT	STANDARD
11 (9)	**IF** a SGIS has actuated, **THEN** override SGIS by placing **ALL** of the following SGIS Override Switches in "OVERRIDE	CB-4 Applicant determined that SGIS has not actuated. [SAT] [UNSAT]
12 (10.a)	**IF** Main Feedwater is available, **THEN** restore S/G levels to 35-85% NR (73-94% WR) by performing the following: Place the "43/FW" Switch in "OFF".	CB-10/11 Applicant ensured that the 43/FW switch was in the OFF Position. [SAT] [UNSAT]
13 (10.b)	Ensure at least one Condensate Pump, FW-2A/B/C, is operating.	CB-10/11 Applicant ensured at least one Condensate Pump was running by checking: • Control Switch Position • Red Light ON • Ammeter Current [SAT] [UNSAT]
		Note to Examiner: The procedure does not direct starting the Lube Oil Pump prior to starting the Main Feed Pump. However, an interlock will prevent the start of the Feed pump unless the Lube Oil Pump is running.

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

STEP	ELEMENT	STANDARD
**14 (10.c)	Start **the “B”** Feed Pump, FW-4B.	CB-10/11 • Applicant started Lube Oil Pump for “B” FW Pump by placing Control Switch in AFTER-START (Red flag) and verifying Red Light ON. • Applicant Started “B” FW Pump by placing Control Switch in AFTER-START(Red flag), Verifying Red Light ON and verifying ammeter Current [SAT] [UNSAT]
15 (10.d)	Open **BOTH** Feed Header Isolation Valves: • HCV-1386 • HCV-1385	CB-10/11 Verified Control Switches in the OPEN Position with Red Light ON. [SAT] [UNSAT]
**16 (10.e)	Manually control feed flow via **BOTH** Feed Reg Bypass Valves: • HCV-1105 • HCV-1106	DCS Adjusted HCV-1105 and/or HCV-1106 to initiate flow to at least one Steam Generator. [SAT] [UNSAT]
17 (10.f)	**IF** Feedwater flow is established, **THEN** GO TO Section 5.0, Exit Conditions.	Determined Feedwater flow was established and exited procedure. [SAT] [UNSAT]

JPM No: S-5 Rev 3

JPM Title: Maintain S/G Water Levels during Startup Using AFW.

Termination Criteria: The Steam Generators are being fed by the "B" Main Feed Pump.

JPM No: S-5 Rev 3

INITIAL CONDITIONS:	**The plant was being maintained in hot shutdown due to a chemistry hold. FW-54 was being used to feed the Steam Generators. When FW-54 tripped, FW-6 was started and used to feed the steam generators through the nozzles. FW-6 tripped 5 minutes ago.**
INITIATING CUE:	**You are directed to restore flow to the Steam Generators per AOP-28, Section 1.**

Fort Calhoun Station
Unit No. 1

OP-ST-VA-3001A

SURVEILLANCE TEST

Title: VENTILATING AIR SYSTEM QUARTERLY CATEGORY A VALVE EXERCISE TEST

FC-68 Number: EC 48010

Reason for Change: Adjusted HCV-881 Close Reference Stroke time for post-maintenance activity.

Requestor: G. Miller

Preparer: L. Hautzinger

VENTILATING AIR SYSTEM QUARTERLY CATEGORY A VALVE EXERCISE TEST

SAFETY RELATED

1. PURPOSE

1.1 To satisfy, in part, the requirements of USAR 4.5.6.5 for:

PCV-742E	HCV-882
PCV-742F	HCV-820A
HCV-746A	HCV-820B
HCV-746B	HCV-883A
HCV-881	HCV-883B

1.2 This test will be performed quarterly in accordance with the Fort Calhoun Station Inservice Inspection Program Plan.

2. REFERENCES/COMMITMENT DOCUMENTS

2.1 Technical Specifications:

- 2.6 Containment System
- 2.8 Refueling Operations
- 2.15 Instrument and Control Systems
- 3.2 Equipment and Sampling Tests
- 3.3 Reactor Coolant System and Other Components Subject to ASME XI Boiler and Pressure Vessel Code Inspection and Testing Surveillance.

2.2 USAR 4.5.6.5: In-service Inspection of ASME Code Class 1, Class 2, and Class 3 Components

2.3 Fort Calhoun Station Inservice Inspection (ISI) Program Plan

2.4 Fort Calhoun Station Off-Site Dose Calculation Manual (ODCM)

2.5 AOP-12, Loss of Containment Integrity

2.6 SO-G-23, Surveillance Test Program

2.7 Drawings

Drawings	File	Description
• 11405-M-1, Sh 1	10431	Containment Heating, Cooling and Ventilation Flow Diagram
• 11405-M-1, Sh 2	48962	Containment Heating, Cooling and Ventilation Flow Diagram

3. DEFINITIONS

Proper Valve Operation in both directions: Smooth stem travel with no indication of

- Excessive binding,
- Unusual hesitation,
- Unusual noise (e.g., squealing),
- Visible stem damage (e.g., bent, deformed, metal filings caused by rubbing),
- Excessive packing leakage,

4. EQUIPMENT LIST

4.1 Test Equipment Required/Used:

EQUIPMENT	OPPD NO. / CAL DUE DATE	INITIALS/DATE
Stopwatch	/ / later	[illegible] / today

5. PRECAUTIONS AND LIMITATIONS

5.1 If any Containment Isolation Valve is found to be inoperable during any step of this procedure, Loss of Containment Integrity, AOP-12 shall be followed.

5.2 All anomalies and deficiencies shall be reported immediately to the Shift Manager and noted in the Comment Sheet. An immediate check shall be made to verify Limiting Conditions for Operation, per Technical Specifications, have not been exceeded.

5.3 Valve stroke times shall be determined by timing the interval between actuation of the control switch and the end of valve motion as observed by full open/closed remote indicating lights.

5.4 If a valve fails to operate properly (as defined in Section 3), contact the System Engineer for evaluation and to determine appropriate corrective action. Note any abnormality on the Comment Sheet.

5.5 Mechanical agitation (tapping), multiple stroking of valves, pre-test stroking of valves or any action taken to produce satisfactory test results due to SOV failure/sticking is prohibited. Any SOV failure/sticking shall result in the valve and its associated process valve, if applicable, being immediately declared inoperable, even if subsequent stroking produces acceptable SOV performance.

5.6 The System Engineer shall be notified within 24 hours of the completion of this test of any marginal, unexpected, or unacceptable results.

6. PREREQUISITES — INITIALS/DATE

6.1 Procedure Revision Verification:

Revision No. 10 — EK / Today

6.2 An RWP has been issued, if required.

RWP No. RWP # — EK / today

6.3 No other test is in progress which could potentially affect this test, or if this test were performed, could have an effect on that test. — EK / Today

6.4 Calibration of test equipment has been verified. — EK / today

6.5 A prejob briefing has been conducted prior to the start of this test. — EK / today

6.6 If remote indication verification is required, then perform OP-ST-VX-3024A concurrently with this test. — N/A /

6.7 Shift Manager authorizes the performance of this test.

Shift Manager Shift Manager Date/Time Today / Now

7. PROCEDURE

NOTE: Step 7.1 can be performed at anytime and repeated as necessary.

NOTE: Independent Verification need not be performed in sequence, but must be completed before starting next attachment(s).

7.1 IF this Surveillance Test is turned over, a prejob briefing must be conducted prior to the continuation of this test. — ____ / ____

7.2 Perform the following Attachments in any order at the discretion of the Shift Manager.

Attachments	Page	
1 - PCV-742E Valve Stroke Test	6	N/A
2 - PCV-742F Valve Stroke Test	10	/
3 - HCV-746A Valve Stroke Test	13	/
4 - HCV-746B Valve Stroke Test	15	/
5 - HCV-881 Valve Stroke Test	16	N/A /
6 - HCV-882 Valve Stroke Test	19	/
7 - HCV-820A Valve Stroke Test	22	/
8 - HCV-820B Valve Stroke Test	23	/
9 - HCV-883A Valve Stroke Test	25	/
10 - HCV-883B Valve Stroke Test	27	/

7.3 Completed by____________________ Date/Time_____/_____

8. RESTORATION

8.1 Shift Manager has been notified this test has been completed.

Shift Manager____________________ Date/Time_____/_____

9. ACCEPTANCE CRITERIA

9.1 Each valve tested fully stroked in less than the Required Action Range indicated on their respective attachments.

10. TEST RECORD

10.1 This entire procedure.

Attachment 4 - HCV-746B Valve Stroke Test

PROCEDURE | INITIALS

NOTE: If Containment Pressure Relief is in progress it may be desirable to delay performance of this test until Containment Pressure Relief is completed.

1. Station an operator at HCV-746B, Containment Pressure Relief Outboard Isolation Valve, in direct coordination with the Control Room to observe for proper valve operation per Section 3 (Rm 60). ________

2. Record "As Found" position for HCV-746B, Cntmt Press Relief (AI-44).

   HCV-746B ________ ________

3. IF HCV-746B is Closed, THEN Open HCV-746B and locally observe for proper valve operation. ________

4. Close HCV-746B and locally observe for proper valve operation. Time valve remotely using control panel lights. ________

5. Record stroke time on Attachment 11 under Test Stroke Time. ________

6. Open HCV-746B and locally observe for proper valve operation. ________

7. IF the initial stroke time was in the Alert Range, THEN perform a verification (second) stroke time by completing the following:

   7.1 Close HCV-746B and time valve remotely using control panel lights. ________

   7.2 Record stroke time on Attachment 11 under Verification Stroke Time. ________

8. Place HCV-746B in the "As Found" position recorded in Step 2 or at the discretion of the Shift Manager. Record “As Left” position.

   HCV-746B ________ ________

Completed by________________________________Date/Time______/________

Attachment 11 - Test Data Evaluation Sheet

Instructions

Page 1 of 2

STA: Compare Test Stroke Times with the Required Action Range values. If the Test Stroke Time is in Required Action Range the valve shall be immediately declared inoperable. If any stroke time is in the Alert Range, the test results require additional analysis.

VALVE	TEST STROKE TIME (sec)	VERIF STROKE TIME * (sec)	REF STROKE TIME (sec)	ALERT RANGE LOW (sec) HIGH	REQUIRED ACTION RANGE (sec)
PCV-742E CLOSE			1.7	<0.9 or >2.5	>4.2
PCV-742F CLOSE			1.2	<0.6 or >1.8	>3.0
HCV-746A CLOSE			2.4	<1.2 or >3.6	>4.0 (1)
HCV-746B CLOSE			2.5	<1.3 or >3.7	>4.0 (1)
HCV-820A CLOSE			1.0	N/A N/A	>2.0
HCV-820B CLOSE			1.0	N/A N/A	>2.0
HCV-820B OPEN			1.0	N/A N/A	>2.0

* Only if required

(1) Value is credited in FC 06959, Site Boundary and Control Room Doses following a LOCA Accident using Alternative Source Term.

Attachment 11 - Test Data Evaluation Sheet

Instructions

STA: Compare Test Stroke Times with the Required Action Range values. If the Test Stroke Time is in Required Action Range the valve shall be immediately declared inoperable. If any stroke time is in the Alert Range, the test results require additional analysis.

VALVE	TEST STROKE TIME (sec)	VERIF STROKE TIME * (sec)	REF STROKE TIME (sec)	ALERT RANGE LOW (sec)	ALERT RANGE HIGH (sec)	REQUIRED ACTION RANGE (sec)
HCV-881 OPEN			13.5	< 10.1	> 16.8	> 33.7 sec.
HCV-881 CLOSE			14.8	< 11.1	> 18.5	> 37.0 sec.
HCV-882 OPEN			13.4	< 10.0	> 16.7	> 33.5 sec.
HCV-882 CLOSE			7.7	< 3.8	> 11.5	> 19.2 sec.
HCV-883A CLOSE			1.6	< 0.8	> 2.4	> 4.0 sec.
HCV-883A OPEN			5.0	< 2.5	> 7.5	> 12.5 sec.
HCV-883B CLOSE			1.0	N/A	N/A	> 2.0 sec.

* Only if required

STA____________________________________ Date/Time_____/_____

ISI Coordinator______________________________ Date/Time_____/_____

Comment Sheet

JOB PERFORMANCE MEASURE

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

Location: Simulator

Approximate Time: 10 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 029000 2.2.12, “Knowledge of surveillance procedures” (RO IMP 3.7 / SRO IMP 4.1)
Procedures: OP-ST-VA-3001A Attachments 4 and 11
Other (tech specs, etc)

Handout(s): OP-ST-VA-3001A, “VENTILATING AIR SYSTEM QUARTERLY CATEGORY A VALVE EXERCISE TEST,” Attachments 4 and 11

Task List#: 0708

Applicable Position(s): RO / SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ________________________________ Date: ____________

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ____________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: This JPM is performed in parallel with JPM S-5

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

TASK STANDARD:	**The Applicant completed stroke time testing of Containment Pressure Relief valve, HCV-746B. HCV-746B was opened to prepare for the test. The Applicant closed HCV-746B while timing the valve closure time. The Applicant recorded the closure time and compared it to the acceptance criteria. The Applicant then reopened the valve to verify proper operation and reclosed the valve to restore it to its "as found" position.**
INITIAL CONDITIONS:	**The reactor is currently in hot shutdown.**
INITIATING CUE:	**You are directed to perform valve stroke time testing of HCV-746B per OP-ST-VA-3001A, Attachment 4 for PMT.** • **An operator has been stationed locally at the valve.** • **A pre-job briefing has been conducted.** • **All prerequisites have been met**

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
		Provide Applicant with a copy of OP-ST-VA-3001A, Attachments 4 and 11
1	**NOTE:** If Containment Pressure Relief is in progress it may be desirable to delay performance of this test until Containment Pressure Relief is completed.	Read note. Determined Containment Pressure Relief is NOT in progress. [SAT] [UNSAT]
2 (1)	Station an operator at HCV-746B, Containment Pressure Relief Outboard Isolation Valve, in direct coordination with the Control Room to observe for proper valve operation per Section 3 (Rm 60).	**Examiner Cue: An Operator is stationed at HCV-746B.**
3 (2)	Record "As Found" position for HCV-746B, Cntmt Press Relief (AI-44). HCV-746B________	AI-44 Green light indicates the valve is closed. Recorded "as found" position as closed. [SAT] [UNSAT]

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

STEP	ELEMENT	STANDARD
**4 (3)	IF HCV-746B is Closed, THEN Open HCV-746B and locally observe for proper valve operation.	AI-44 Turned control switch to OPEN and verified RED light ON [SAT] [UNSAT] **CUE: Local Operator reports valve opened with no indication of:** • **Excessive binding** • **Unusual hesitation** • **Unusual noise** • **Visible stem damage** • **Excessive packing leakage**
**5 (4)	Close HCV-746B and locally observe for proper valve operation. Time valve remotely using control panel lights.	AI-44 Turned control switch to CLOSE and verified GREEN light ON Used stopwatch to time valve using control panel lights. [SAT] [UNSAT] **CUE: Local Operator reports valve closed with no indication of:** • **Excessive binding** • **Unusual hesitation** • **Unusual noise** • **Visible stem damage** • **Excessive packing leakage**

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

STEP	ELEMENT	STANDARD
**6 (5)	Record stroke time on Attachment 11 under Test Stroke Time.	Recorded stroke time on Att. 11 [SAT] [UNSAT]
**7 (6)	Open HCV-746B and locally observe for proper valve operation.	AI-44 Turned control switch to OPEN and verified RED light ON [SAT] [UNSAT] **CUE: Local Operator reports valve opened with no indication of:** • **Excessive binding** • **Unusual hesitation** • **Unusual noise** • **Visible stem damage** • **Excessive packing leakage**
8 (7)	IF the initial stroke time was in the Alert Range, THEN perform a verification (second) stroke time by completing the following: 7.1 Close HCV-746B and time valve remotely using control panel lights. 7.2 Record stroke time on Attachment 11 under Verification Stroke Time.	Determined that the stroke tome was NOT in the Alert Range [SAT] [UNSAT]

JPM No: S-6 Rev 3

JPM Title: Valve stroke time testing of HCV-746B

STEP	ELEMENT	STANDARD
**9 (8)	Place HCV-746B in the "As Found" position recorded in Step 2 or at the discretion of the Shift Manager.	**CUE: If asked, "Shift Manager directs HCV-746B be placed in its "as found" position** AI-44 Turned control switch to CLOSE and verified GREEN light ON [SAT] [UNSAT]
		CUE: Local Operator reports valve closed with no indication of: • **Excessive binding** • **Unusual hesitation** • **Unusual noise** • **Visible stem damage** • **Excessive packing leakage**
10	Record "As Left" position. HCV-746B _____	Recorded as left position as closed [SAT] [UNSAT] **CUE: JPM Complete**

Termination Criteria: Valve stroke time testing for HCV-746B completed

JPM No:

INITIAL CONDITIONS:	**The reactor is currently in hot shutdown.**

INITIATING CUE:	**You are directed to perform valve stroke time testing of HCV-746B per OP-ST-VA-3001A, Attachment 4 for PMT.** • **An operator has been stationed locally at the valve.** • **A pre-job briefing has been conducted.** • **All prerequisites have been met**

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

Location:

Approximate Time: 20 minutes Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A#
Procedures: TDB-V.1.B “Estimated Critical Conditions Worksheet”, Rev 23
OP-2A, Attachment 2, “CEA Withdrawal to Criticality Mode 2. Rev 107,
OI-CH-4, Attachment 4, “Normal Dilution of the RCS”, Rev 45

Handout(s): TDB-V.1.B
OP-2A, Attachment 2
OI-CH-4

Task List#: 0124

Applicable Position(s):

Time Critical: No

Alternate Path: Yes

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

JPM Prepared by: ______________________________ Date: ___________

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ____________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

Comments:

TASK STANDARD:	**Applicant began dilution to the ECC boron concentration. During dilution, an unexpected rise in reactivity occurred, and Applicant stopped the dilution in progress.**
INITIAL CONDITIONS:	**The plant is shutdown in Mode 3. A plant startup is in progress per OP-2A, PLANT STARTUP, Attachment 2, "CEA Withdrawal to Criticality Mode 2". Actions have been taken through Step 4 of OP-2A, Attachment 2, to withdraw Shutdown Groups A and B to the ARO position. TDB-V.1.B "Estimated Critical Conditions Worksheet" has been completed to determine final boron concentration.**
INITIATING CUE:	**You are directed to dilute the RCS to the ECC Boron Concentration as calculated in TDB-V.1.B, "Estimated Critical Conditions Worksheet" per Step 5 of OP-2A, Attachment 2.**

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
1		**CUE: Provide copy of OP-2A, Attachment 2 and ECC Worksheet.**
2 (OP-2A, Att. 2, Step 5)	IF required, THEN dilute the RCS per OI-CH-4 until ECC Boron Concentration is obtained.	Obtained copy of OI-CH-4. [SAT] [UNSAT] **CUE: Provide copy of OI-CH-4, Attachment 4**
3 (OI-CH-4, Att. 4)	Review prerequisites.	All prerequisites are met. [SAT] [UNSAT]
4 (OI-CH-4, Att. 4, Step 1)	Record the following values: • Current RCS Boron Concentration___ppm • Desired RCS Boron Concentration____ppm • RCS T_{avg}_____°F	Obtained current boron concentration from ECC, RCS T_{avg} from control room instrumentation/plant computer and desired boron concentration from TDB-V-1.B Recorded values. [SAT] [UNSAT]
5	**<u>NOTE</u>** Verifier must independently assess initial parameters as part of calculation verification per OI-ERFCS-1 or TDB-V.12.	Read Note. [SAT] [UNSAT]

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

STEP	ELEMENT	STANDARD
6 (OI-CH-4, Att. 4, Step 2)	Determine the number of gallons of Makeup Water to be added using ERF computer per OI-ERFCS-1 or the Dilution Formula in TDB-V.12	Determined number of gallons to be added. [SAT] [UNSAT] **CUE: STA has determined that 500 gallons of makeup water must be added.** **CUE: Independent verifier has verified calculation and 500 gallons.**
7 (OI-CH-4, Att. 4, Step 3)	Record the number of gallons of makeup water to be added to the RCS	Recorded 500 gallons to be added. [SAT] [UNSAT]
8 (OI-CH-4, Att. 4, Step 4)	Ensure HC-269, Makeup Water Mode Selector Switch, is in DILUTE.	<u>CB-4</u> Ensured HC-269 was in the DILUTE position. [SAT] [UNSAT]
9 (OI-CH-4, Att. 4, Step 5)	Ensure FCV-269, Makeup Water Control Valve, is in CLOSE.	<u>CB-4</u> Ensured FCV-269 was in CLS position. GREEM light ON, RED light OFF [SAT] [UNSAT]
10	<u>**NOTE**</u> Dilution of the RCS may be performed in intermittent batches of makeup water to verify proper response.	Read Note. [SAT] [UNSAT]

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

STEP	ELEMENT	STANDARD
**11 (OI-CH-4, Att. 4, Step 6)	Set FQS-269X, Demin Water Flow Batching Switch, to the desired number of gallons of water to be added	CB-4 Set FQS-269X to (500) gallons [SAT] [UNSAT] **NOTE: Applicant may choose to batch intermittently to verify proper response. This is allowed by procedure so long as the total will be 500 gallons.**
12 (OI-CH-4, Att. 4, Step 7)	Record initial Demin Water Makeup Flow Totalizer reading: FQI-269X __________ gal	CB-4 Read and recorded value on Makeup Flow Totalizer FQI-269X. [SAT] [UNSAT]
13	**NOTE** 1. Makeup Water flow may be stopped at any time by closing FCV-269. 2. Steps 8 through 14 may be signed off after these steps are complete.	Read Notes. [SAT] [UNSAT]
**14 (OI-CH-4, Att. 4, Step 8)	Open FCV-269	CB-4 Opened FCV-269. Placed FCV-269 Control Switch in OPN position. Verified RED light ON, GREEN light OFF [SAT] [UNSAT]

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

STEP	ELEMENT	STANDARD
15	**<u>CAUTION</u>** All available indications shall be monitored for desired effects during any reactivity change.	Read Caution. [SAT] [UNSAT]
**16 (OI-CH-4, Att. 4, Step 9)	Place FCV-269X, Demin Water Makeup Flow Control Valve, in AUTO	<u>CB-4</u> Placed FCV-269X in AUT position. [SAT] [UNSAT]
17 (OI-CH-4, Att. 4, Step 10)	With FC-269X, Demin Water Makeup Flow Controller, set Demin Water flow to the desired flow rate.	<u>CB-4</u> Set FC-269X to desired flow rate. [SAT] [UNSAT] **CUE: Desired flow rate is 80 gallons per minute.**
18 (OI-CH-4, Att. 4, Step 11)	Verify VCT level and pressure respond as expected.	<u>CB-1,2,3</u> Verified response is as expected. (slow increase in level and pressure) [SAT] [UNSAT]
Alternate Path Begins		
		Examiner Note: Source range count rate will begin to increase

JPM No: S7 Rev 3

JPM Title: Dilute RCS to Estimated Critical Conditions Boron Concentration

STEP	ELEMENT	STANDARD
**19 (OI-CH-4, Att. 4, Step 12)	If unexpected reactivity effects are observed, then stop the makeup flow and evaluate. Unexpected reactivity effects occur after approximately 150 gallons added.	Recognized indications of undesired reactivity change and terminated dilution. Closed FCV-269X by placing FCV-269X Control Switch in CLS position. Verified GREEN light ON, RED light OFF **OR** Closed FCV-269 by placing FCV-269 Control Switch in CLS position. Verified GREEN light ON, RED light OFF [SAT] [UNSAT] **CUE: Acknowledge report of unexpected reactivity effects** **CUE: JPM Complete**

Termination Criteria: Dilution was secured due to unexpected reactivity effects at approximately 150 gallons added.

JPM No: S-7 Rev 3

INITIAL CONDITIONS:	**The plant is shutdown in Mode 3. A plant startup is in progress per OP-2A, PLANT STARTUP, Attachment 2, "CEA Withdrawal to Criticality Mode 2". Actions have been taken through Step 4 of OP-2A, Attachment 2, to withdraw Shutdown Groups A and B to the ARO position. TDB-V.1.B "Estimated Critical Conditions Worksheet" has been completed to determine final boron concentration.**

INITIATING CUE:	**You are directed to dilute the RCS to the ECC Boron Concentration as calculated in TDB-V.1.B, "Estimated Critical Conditions Worksheet" per Step 5 of OP-2A, Attachment 2.**

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PREREQUISITES (✓) INIT/DATE

1. Procedure Revision Verification

   Revision No. 107 — EK / today

2. OP-1 requirements for criticality are completed. — EK / today

3. A prejob brief, per SO-G-92, has been conducted prior to the start of this evolution. Department Manager or above attendance is required at the prejob brief. **[SOER 10-2]** — BM / today SO-G-92 Briefing Manager

NOTES
1. Do not connect an inoperable Wide Range Logarithmic Channel to a scaler-timer.
2. The scaler-timers should be disconnected from the Wide Range Logarithmic Channel when the scaler-timers are not in use.
3. One operable Wide Range Logarithmic Channel (not connected to a scaler-timer) shall be used to verify the proper response of the channels connected to the scaler-timers unless otherwise directed by the Reactor Engineer.

4. Scaler-timers are connected to operable Wide Range Logarithmic Channels A and C, OR as directed by the Reactor Engineer.
   Channels (circle as applicable) A B C D — FTC / today I&C; IV / Today Ind Verif

5. STA is available to perform 1/M plots during the approach to criticality. — EK / Today

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PREREQUISITES (continued) (✓) INIT/DATE

6. Margin to Trip meters on CB-4 indicate less than or equal to 20% power. EK / Today
7. HC-909, Steam Dump Auto/Inhibit Switch, is in INHIBIT. EK / Today
8. RCS temperature is being maintained between 529-535°F. EK / Today
9. H_2 concentration in the VCT gas space is greater than 80%. EK / Today Chemist
10. Condensate Pump Discharge Suspended Solids is less than or equal to 0.100 ppm. EK / Today Chemist
11. Maximum Spray Operation shall be performed per OI-RC-7. EK / Today
12. Pressurizer level is being automatically maintained between 44-52% (normal 48%). EK / Today
13. Pressurizer pressure control is in AUTO AND maintaining between 2075-2150 psia (normal 2100 psia). EK / Today
14. Control Element Assembly drive control system is operable. EK / Today
15. The Reactor is shutdown with all CEAs fully inserted. EK / Today
16. Estimated Critical Conditions (ECC) Worksheet has been completed. EK / Today
17. All operable Wide Range NIs indicate greater than one CPS. If less than one CPS, consult the Reactor Engineer. EK / Today
18. Audible Count Rate Meter is in service. EK / Today
19. A Specifically Designated RO or SRO Licensed Operator has been assigned to take the Reactor critical.

    Designated Operator DO EK / Today
20. Ensure Containment is evacuated of personnel. EK / Today
21. Flushing through FW-16A and FW-16B Feedwater Heaters is secured. EK / Today

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PREREQUISITES (continued) (✓) INIT/DATE

22. The following valves are open:

- FW-137, HP Heater FW-16A Outlet Valve ✓
- FW-138, HP Heater FW-16B Outlet Valve ✓ EK / Today

PROCEDURE

1. Review the Estimated Critical Condition Worksheet for Critical CEA position AND their ± 1% Δρ values calculated in TDB-V.1b. EK / today

CAUTION
Only one method of positive reactivity addition shall be used at any one time.

2. IF required,
THEN borate the RCS per OI-CH-4 until ECC Boron Concentration is obtained. N/A

3. Place each Zero Power Mode Bypass Switch on the RPS cabinets to OFF and verify the following:

- Lo Flow light goes out for each channel ✓
- TM/LP Bypass light goes out for each channel ✓
- The Zero Power Mode Bypassed annunciator clears (CB-4, A20) ✓ EK / Today

4. Withdraw Shutdown Groups A and B to ARO using the Manual Group (MG) mode per OI-RR-1. EK / Today

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PROCEDURE (continued) (✓) INIT/DATE

NOTE
Sufficient time should be given prior to obtaining a RCS sample to allow proper mixing.

5. IF required,
THEN dilute the RCS per OI-CH-4 until ECC Boron Concentration is obtained. ____/____

6. IF not withdrawn,
THEN withdraw all Non-Trippable CEAs to ARO using the Manual Group (MG) mode per OI-RR-1. ____/____

7. Commence Reactor Engineer criticality Log (Figure 2). ____/____
RE

8. Verify all individual Shutdown and Non-Trippable CEAs positions indicate fully withdrawn by Individual CEA Position indicators. ____/____

9. RCS Hydrogen concentration is greater than or equal to 15 cc/kg. ____/____
Chemist

10. Withdraw regulating CEA Groups 1, 2, 3, and 4 to four inches using Manual Individual Control. ____/____

11. Commence 1/M Plots per OP-2A Attachment 2A and establish a 100 second Base Count Rate per OP-2A Attachment 2A. ____/____
STA

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PROCEDURE (continued) (✓) INIT/DATE

NOTE

CEA withdrawal may be halted at additional hold points for 1/M plotting at the discretion of the Reactor Engineer.

CAUTION

The Reactor shall be considered critical when there is sustained rising flux level (positive Startup Rate) with no CEA movement OR Reactor Power indicates greater than 10^{-4}%.

12. Using the Manual Sequential (MS) mode, take the Reactor critical by withdrawing the Regulating CEA Groups per OI-RR-1 as follows:

    a. Withdraw Group 1 to 90 inches. ______/______

    b. Wait five minutes while monitoring count rate. ______/______

    c. Verify the 1/M plot predicts that the reactor will go critical above the Power Dependent Insertion Limit (PDIL). ______/______

    d. IF the 1/M plot predicts that the reactor will go critical below PDIL OR outside the ECP ± 1% $\Delta\rho$, THEN consult the Reactor Engineer or their designated alternate for guidance. ______/______

    e. Withdraw Group 2 to 90 inches, AND verify Group 1 All Rods Out (ARO). ______/______

    f. Wait five minutes while monitoring count rate. ______/______

    g. Verify the 1/M plot predicts that the reactor will go critical above the Power Dependent Insertion Limit (PDIL). ______/______

    h. IF the 1/M plot predicts that the reactor will go critical below PDIL OR outside the ECP ± 1% $\Delta\rho$, THEN consult the Reactor Engineer or their designated alternate for guidance. ______/______

    i. Withdraw Group 3 to 90 inches, AND verify Group 2 All Rods Out (ARO). ______/______

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PROCEDURE (continued) (✓) INIT/DATE

12

j. Verify Group 4 is at approximately 18 inches withdrawn. ____/____

k. Wait five minutes while monitoring count rate. ____/____

l. Verify the 1/M plot predicts that the reactor will go critical above the Power Dependent Insertion Limit (PDIL). ____/____

m. IF the 1/M plot predicts that the reactor will go critical below PDIL OR outside the ECP ± 1% $\Delta\rho$, THEN consult the Reactor Engineer or their designated alternate for guidance. ____/____

n. IF the 1/M plot predicts that the reactor will go critical beyond Group 4 ARO,
THEN complete the following:

1) Withdraw Group 4 to 60 inches. ____/____

2) Verify Group 3 All Rods Out (ARO). ____/____

3) Wait five minutes while monitoring count rate. ____/____

4) Verify the 1/M plot predicts that the reactor will go critical above the Power Dependent Insertion Limit (PDIL). ____/____

5) IF the 1/M plot predicts that the reactor will go critical below PDIL OR outside the ECP ± 1% $\Delta\rho$, THEN consult the Reactor Engineer or their designated alternate for guidance. ____/____

CAUTION
Do not exceed 115 inches on Group 4.

o. Withdraw Group 4 as required to achieve criticality or a maximum height of 115 inches. ____/____

13. IF criticality is not reached by Group 4 at 115 inches,
THEN complete the following:

a. Wait five minutes while monitoring count rate. ____/____

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PROCEDURE (continued) (✓) INIT/DATE

13

b. Perform TDB-V.1.b Step F. ______/______ STA

c. Insert Group 4 using the Manual Sequential (MS) mode per OI-RR-1 to the minimum position determined in TDB-V.1.b Step F.4 or lower. ______/______

d. Dilute the RCS by the amount determined in TDB-V.1.b Step F.5 per OI-CH-4, Attachment 6. ______/______

e. Allow for adequate mixing in the RCS AND obtain a RCS boron sample. ______/______

f. Perform a 100 second Base Count Rate per OP-2A, Attachment 2A. ______/______

g. Withdraw Group 4 using the Manual Sequential (MS) mode per OI-RR-1 as directed by Reactor Engineer. ______/______

h. Wait five minutes while monitoring count rate. ______/______

i. IF the 1/M prediction shows criticality prior to ARO, THEN withdraw Group 4 as required to achieve criticality. ______/______

j. IF the 1/M prediction is beyond ARO, THEN consult with the Reactor Engineer for further actions. ______/______

14. IF the reactor should go critical below the Power Dependent Insertion Limit (PDIL), THEN perform the following:

a. Ensure the reactor is subcritical. ______/______

b. Consult the Reactor Engineer OR their designated alternate for guidance. ______/______

15. At 10^{-3}% Reactor power perform the following:

a. Insert Group 4 using the Manual Sequential (MS) mode per OI-RR-1 to stabilize Reactor power. ______/______

Attachment 2 - CEA Withdrawal to Criticality Mode 2

PROCEDURE (continued) (✓) INIT/DATE

15

b. Verify the High Power Rate of Change Trip is enabled by performing the following:

1) Verify HIGH POWER RATE OF CHANGE TRIP ENABLED (CB-4, A20, E-4) is in alarm ___

2) Verify the level 1 light is on for operable wide range power drawers. ___ ____/____

c. Record Actual Critical Data on TDB-V.1.B, Estimated Critical Conditions Worksheet, AND Control Room Log. ____/____

d. Discontinue the RE Criticality Log AND attach to this procedure. ____/____

16. Remove the scaler timers connected to the Wide Range Logarithmic Channels. ____/____
I&C
____/____
Ind Verif

17. IF it is desired to raise power, THEN refer to OP-2A Attachment 4. ____/____

Completed by______________________ Date/Time ____/____

Fort Calhoun Station
Unit No. 1

OI-CH-4

OPERATING INSTRUCTION

Title: CHEMICAL AND VOLUME CONTROL SYSTEM MAKEUP OPERATIONS

FC-68 Number: EC 45338

Reason for Change: Added a precaution concerning the risk of operating FC-269Y at a flow rate of greater than or equal to 25 gpm.

Requestor: S. Breault

Preparer: L. Hautzinger

Editorial Correction (a) EC 45710: Pages 2, 3, and 36 (05-14-09)

CHEMICAL AND VOLUME CONTROL SYSTEM MAKEUP OPERATIONS

ATT PURPOSE PAGE

PRECAUTIONS

1. A minimum of one Reactor Coolant Pump or Low Pressure Safety Injection Pump supplying Shutdown Cooling must be in operation when changing Reactor Coolant System Boron Concentration.

2. Dilution to criticality shall not be initiated or continued when the CEAs are at or below the Power Dependent Insertion Limit.

3. When diluting to obtain the ECC Boron Concentration, Shutdown Groups A and B must be ARO.

4. During Refueling Operations, borated water supplies available for makeup to the Reactor Coolant System must have a Boron Concentration greater than or equal to Refueling Boron Concentration.

5. Do not allow VCT pressure to exceed 65 psig.

PRECAUTIONS (continued)

6. With LCV-218-1 in AUTO letdown will be diverted to waste if VCT level is allowed to exceed 94.4%.

7. Boric Acid and Demineralized Water Totalizer readings will be logged every 2 hours on FC-75 to accurately track makeup to the RCS.

8. The effects of Boration or Dilution should be observed in terms of changes in Source Count Rate or RCS Cold Leg Temperature.

9. During Boric Acid addition, when FQS-269Y, Boric Acid Batching Switch, counts down to zero, FCV-269Y will close.

10. During Makeup Water addition, when FQS-269X, Demin Water Batching Switch, counts down to zero, FCV-269X will close.

11. The Demin Water Batching Switch FQS-269X and Flow Totalizer FQI-269X measure Demin Water addition in tens of gallons. Actual number of gallons added, or to be added, is 10 times the indicated value.

12. With the control switches for FCV-269X, Demin Water Makeup Flow Control Valve and FCV-269Y, Boric Acid Makeup Flow Control Valve, in AUTO:

    - A loss of control power to FCV-269Y will cause both FCV-269Y and FCV-269X to close
    - A loss of control power to FCV-269X will close FCV-269X only

13. The inherent design of FQI-269X allows internal pulses to accumulate (100 pulses = 10 gallons). These pulses carry over from one use of the counter to the next. Once these extra pulses add to 100, an extra 10 gallons will be added. Therefore, operators must be continuously alert of all indications and be prepared to secure from an evolution if indications warrant.

14. Setting Flow Controller FC-269Y to greater than or equal to 25 gpm creates the possibility for the totalizer to click off an extra gallon of boric acid. (CR 2008-4382)

15. Minimize any pressure lock condition between the SI loop check valves in Mode 1, 2 or 3. A pressure lock is indicated by greater than or equal to 500 psig on SI Leakage Cooler inlet pressure transmitter(s). If the pressure lock is maintained for greater than 30 minutes in any 24 hour period without SI or CVCS flow, RCS coolant leak by, due to lower differential pressure across SI check valve(s), may result. Production of steam and resultant water hammer is possible. (CR 200505030)

16. Due to Containment Sump Strainer clogging issues following a LOCA, BAST levels should be kept greater than or equal to 85% and BAST concentrations should be kept greater than or equal to 3% (NRC Bulletin 2003-01).

REFERENCES/COMMITMENT DOCUMENTS

1. Technical Specification

   - 2.2.7: Chemical and Volume Control System Borated Water Source - Shutdown
   - 2.2.8: Chemical and Volume Control System Borated Water Sources - Operating

2. Technical Data Book (TDB) Figures:

   - TDB-III.37A, Boron Addition Rate (HZP) SIRWT @ 1900 ppm
   - TDB-III.37B, Boron Addition Rate (HZP) SIRWT @ 2000 ppm
   - TDB-III.37C, Boron Addition Rate (HZP) SIRWT @ 2100 ppm
   - TDB-III.37D, Boron Addition Rate (HZP) SIRWT @ 2200 ppm
   - TDB-III.37I, Boron Addition Rate (HZP) SIRWT @ 2300 ppm
   - TDB-III.37E, Boron Addition Rate (HZP) BASTs @ 3.0% BA
   - TDB-III.37F, Boron Addition Rate (HZP) BASTs @ 3.5% BA
   - TDB-III.37G, Boron Addition Rate (HZP) BASTs @ 4.0% BA
   - TDB-III.37H, Boron Addition Rate (HZP) BASTs @ 4.5% BA
   - TDB-III.38A, Boron Addition Rate (HFP) SIRWT @ 1900 ppm
   - TDB-III.38B, Boron Addition Rate (HFP) SIRWT @ 2000 ppm
   - TDB-III.38C, Boron Addition Rate (HFP) SIRWT @ 2100 ppm
   - TDB-III.38D, Boron Addition Rate (HFP) SIRWT @ 2200 ppm
   - TDB-III.38I, Boron Addition Rate (HFP) SIRWT @ 2300 ppm
   - TDB-III.38E, Boron Addition Rate (HFP) BASTs @ 3.0% BA
   - TDB-III.38F, Boron Addition Rate (HFP) BASTs @ 3.5% BA
   - TDB-III.38G, Boron Addition Rate (HFP) BASTs @ 4.0% BA
   - TDB-III.38H, Boron Addition Rate (HFP) BASTs @ 4.5% BA
   - TDB-V.12, Miscellaneous Formula Sheet

3. Commitments other than Ongoing:

   - AR 13140, LER 92-027

4. CR 200505030

5. CR 2008-4382

6. Drawing

Drawing	File	Description
E-23866-210-120, Sh1	10476	Chemical and Volume Control System
E-23866-210-121, Sh 1	10478	Chemical and Volume Control System
E-23866-210-121, Sh 2	55250	Chemical and Volume Control System
E-23866-210-130, Sh 1	10479	Safety Injection and Containment Spray System

APPENDICES

None

Attachment 4 - Normal Dilution of the RCS

PREREQUISITES (√) INITIALS

1. Procedure Revision Verification

   Revision No. 45 Date: d4tc ______

2. A Deaerated Water Booster Pump, DW-43A or DW-43B, is in operation OR if cross-connected to Demin Water, a Demineralized Water Booster Pump, DW-41A or DW-41B, is in operation. ______

3. Waste Disposal System is available to receive Letdown flow diverted from the VCT. ______

4. At least one of the following is in operation:

   - One or more Reactor Coolant Pumps ✓
   - One LPSI Pump supplying Shutdown Cooling ___ ______

PROCEDURE

1. Record the following values:

   - Current RCS Boron Concentration______ppm ___
   - Desired RCS Boron Concentration______ppm ___
   - RCS T_{avg} ____________°F ___ ______

NOTE
Verifier must independently assess initial parameters as part of calculation verification per OI-ERFCS-1 or TDB-V.12.

2. Determine the number of gallons of Makeup Water to be added using the ERF Computer per OI-ERFCS-1 or the Dilution Formula in TDB-V.12. ______

   ______
   Ind Verif

3. Record the number of gallons of Makeup Water to be added to the RCS.

   ___________Gallons ______

4. Ensure HC-269, Makeup Water Mode Selector Switch, is in DILUTE. ______

Attachment 4 - Normal Dilution of the RCS

PROCEDURE (continued) (√) INITIALS

5. Ensure FCV-269, Makeup Water Control Valve, is in CLOSE. ________

NOTE

Dilution of the RCS may be performed in intermittent batches of makeup water to verify proper response.

6. Set FQS-269X, Demin Water Makeup Flow Batching Switch, to the desired number of gallons of water to be added. ________

7. Record initial Demin Water Makeup Flow Totalizer reading:

   FQI-269X________gals ________

NOTE

1. Makeup Water flow may be stopped at any time by closing FCV-269.
2. Steps 8 through 14 may be signed off after these steps are complete. ________

8. Open FCV-269.

CAUTION

All available indications shall be monitored for desired effects during any reactivity change.

9. Place FCV-269X, Demin Water Makeup Flow Control Valve, in AUTO. ________

10. With FC-269X, Demin Water Makeup Flow Controller, set Demin Water flow to the desired flow rate. ________

11. Verify VCT level and pressure respond as expected. ________

12. IF unexpected reactivity effects are observed,
    THEN stop the makeup flow and evaluate. ________

13. WHEN Dilution is complete,
    THEN place FCV-269X in CLOSE. ________

Attachment 4 - Normal Dilution of the RCS

PROCEDURE (continued) (√) INITIALS

14. Close FCV-269. ________

15. Record final Demin Water Makeup Flow Totalizer reading:

    FQI-269X_______gals ________

16. Verify the amount of Demin Water added from the flow totalizer is consistent with the amount of water added. ________

Completed by ______________________________ Date/Time ________/_____

Part II - Performed after a refueling outage.

12-01
Criticality No.

Today
Date

A. Conditions at Time of Startup

A.1. Startup date and time. Today (DATE) time (TIME)

A.2. Desired CEA Group 4 position at time of startup. (Manual Sequential Mode)

Group 4 85 inches

A.3. Sequential Rod Worth at ARO (TDB Figure II.B.2.a) 3.21 %Δρ

A.4. Sequential Rod Worth, Group 4 at position from A.2 (TDB Figure II.B.2.a) 3.05 %Δρ

A.5. Critical Boron Concentration for BOC, ARO, HZP No Xenon (TDB Figure II.A.1.a.1) 1562 ppm

A.6. Reactor Coolant System Inverse Boron Worth (TDB Figure II.A.4) 127 ppm / %Δρ

A.7. Current RCS Boron Concentration 1565 ppm Sample Date/Time Today/now

B. Estimated Critical Boron Concentration

B.1. Change in reactivity due to CEA Group 4

3.21 (A.3) %Δρ – 3.05 (A.4) %Δρ = 0.16 (B.1) %Δρ

B.2. Change in boron due to CEA Group 4

0.16 (B.1) %Δρ X 127 (A.6) ppm/%Δρ = 20 (B.2) ppm

B.3. Estimated Critical Boron Concentration (ECB)

1562 (A.5) ppm – 20 (B.2) ppm = 1542 (B.3) ppm

C. Calculation of Reactor Coolant System Additions Required

C.1. Calculate the gallons of water or boric acid required to attain the ECB boron concentration using the plant computer following OI-ERFCS-1A, Attachment 8.

Gallons of water required: 500

Gallons of boric acid required: ______

Circle boric acid source: CH-11A 3.31 % (% boron) CH-11B 3.31 % (% boron)

D. Minimum and Maximum Critical Rod Position

D.1. The maximum critical CEA position is CEA Group 4 at ARO.

D.2. Find the minimum critical CEA position.

D.2.a. Calculate the critical CEA worth –1%Δρ by subtracting 1%Δρ from the critical CEA worth A.4.

3.05 (A.4) – 1%Δρ = 2.05 (D.2.a) %Δρ

D.2.b. Using TDB Figure II.B.2.a, find the CEA position corresponding to estimated critical rod position –1%Δρ and enter here.

Group 1 126 inches

Group 2 100 inches

Group 3 Ø inches

Group 4 Ø inches

D.2.c. Using TDB Section VI COLR Figure 2, record the zero power dependent insertion limit by obtaining PDIL or transient insertion limit value for 0% power.

Group 1 126 inches

Group 2 126 inches

Group 3 25 inches

Group 4 Ø inches

D.2.d. Use the higher of CEA positions from D.2.b and D.2.c as the minimum critical CEA position.

Group 1 126 inches

Group 2 126 inches

Group 3 25 inches

Group 4 Ø inches

D.3. Completed by ____________ Date/Time Today / Now

D.4. Results of this calculation have been independently reviewed prior to Reactor Criticality.

Reactor Engineer ____________ Date/Time Today / Now

E. Perform the Following if the Reactor Is Not Critical with Group 4 at 115"
(Otherwise this is N/A)

E.1. Using Figure TDB II.B.3.a, determine the amount of reactivity needed to offset inserting Group 4 to 85".

______________ – ______________ = ______________ %Δρ
CEA worth @ 115" CEA worth @ 85" E.1

E.2. Calculate RCS boron dilution change using Inverse Boron Worth (Step A.6) and the reactivity difference calculated in Step E.1.

______________ ppm/%Δρ X ______________ %Δρ = ______________ ppm
A.6 E.1 E.2

E.3. Calculate the New desired critical boron concentration.

______________ ppm – ______________ ppm = ______________ ppm
B.3 E.2 E.3

E.4. Performed by ________________________ Date/Time ______/______

E.5. Verify Step E calculations reviewed prior to Reactor Criticality.

Reactor Engineer ________________________ Date/Time ______/______

F. Actual Critical Data

F.1. After achieving criticality, complete the following record:

F.1.a. CEA Positions

Group 1 ______________ inches

Group 2 ______________ inches

Group 3 ______________ inches

Group 4 ______________ inches

Group N ______________ inches

F.1.b. Reactor Coolant System boron concentration: ______________ ppm

F.1.c. Time at which criticality was attained: ______________

F.1.d. Reactor Coolant System average temperature (T_{AVG}): ____________ °F

F.2. Completed by __________________________ Date/Time _______/_______

G. Review

G.1. Forward to Reactor Engineer for review.

NOTE: If the reactivity difference between actual and estimated critical conditions is greater than 0.5%$\Delta\rho$, then the Reactor Engineer will review the results with the Supervisor-Reactor Physics and determine the appropriate actions, if necessary.

G.2. Reviewed by __________________________ Date/Time _______/_______
Supervisor-Reactor Performance Analysis

G.3. Reviewed by __________________________ Date/Time _______/_______
Reactor Engineer

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

Location: Simulator

Approximate Time: 20 minutes Start Time:__________________

End Time:____________________

Actual Time: _________________

Reference(s): K/A# 062000 A4.01 RO IMP:3.3 SRO IMP: 3.1
Ability to manually operate and/or monitor in the control room: All breakers (including applicable switchyard)

Procedures: OI-EE-1, Attachment 2, Rev 28
Other (tech specs, etc)

Handout(s): OI-EE-1, Attachment 2, "Feed Non-Vital Buses 1A1 and 1A2 From 345 KV."

Task List#: 0290

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: _________________________________ Date: ____________

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

Operators' Name:

All Critical Steps (shaded) must be performed or simulated in accordance with the standards contained in this JPM

The Operator's performance was evaluated as (circle one):

SATISFACTORY **UNSATISFACTORY**

Evaluator's Signature: ______________________________ Date: __________

Reason, if unsatisfactory:

Tools & Equipment:

Safety Considerations:

Comments: This JPM is performed in parallel with JPM S-3. IC# 107

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

TASK STANDARD:	**The Applicant transferred buses 1A1 and 1A2 from 161 KV to 345 KV. Applicant closed breaker 3451-5. Applicant then closed breaker 1A11 and opened breaker 1A31 transferring bus 1A1 from 161 KV to 345 KV. Applicant then closed breaker 1A22 and opened breaker 1A42 transferring bus 1A2 from 161 KV to 345 KV.**
INITIAL CONDITIONS:	**The plant is in hot shutdown following a normal plant shutdown using OP-3A. 345 KV is in service per OI-EG-1. Breaker 3451-4 is not available because substation is correcting a low gas pressure.**
INITIATING CUE:	**You are directed to transfer 4160 V buses 1A1 and 1A2 from 161 KV to 345 KV using OI-EE-1, Attachment 2. Line Dispatch has ensured all Substation Personnel are clear of the breakers.** **All prerequisites are met.**

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

Critical Steps shown in gray and **

STEP	ELEMENT	STANDARD
		Provide Applicant with a copy of OI-EE-1, Attachment 2
1	**NOTE:** Steps 1 and 2 may be performed in any order.	Read note. [SAT] [UNSAT]
2 (1.)	IF open and available, THEN close 3451-4 as follows:	Determined breaker 3451-4 was not available [SAT] [UNSAT]
**3 (2.a)	IF open and available, THEN close 3451-5 as follows: a. Turn on Synchroscope for 3451-5.	CB-20 Placed switch handle in synch switch 3451-5 and turned clockwise. [SAT] [UNSAT]
4 (2.b)	Verify Synchroscope is approximately at a 12 o'clock position.	CB-20 Verified Synchroscope dial at 12 o'clock. [SAT] [UNSAT]

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

STEP	ELEMENT	STANDARD
**5 (2.c)	Close 3451-5.	CB-20 • Placed Control switch for breaker 3451-5 in the AFTER-CLOSE (Red flag) position • Verified RED light ON [SAT] [UNSAT]
6 (2.d)	Turn off Synchroscope.	CB-20 Turned switch handle in synch switch 3451-5 counter-clockwise. [SAT] [UNSAT]
7 (3.a)	Transfer 1A1, Non-Vital Bus, to 22 KV as follows: a. Ensure 43/1A1-1A3, Fast Transfer Switch, is in MANUAL.	CB-20 Verified 43/1A1-1A3 in MANUAL position [SAT] [UNSAT]
8 (3.b)	Turn on Synchroscope for 1A11.	CB-20 Placed switch handle in synch switch 1A11 and turned clockwise. [SAT] [UNSAT]
9 (3.c)	Verify Incoming and Running voltages are approximately matched.	CB-20 Verified voltages on Incoming and Running voltmeters are approximately equal [SAT] [UNSAT]

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

STEP	ELEMENT	STANDARD
10 (3.d)	Verify Synchroscope is approximately at a 12 o'clock position.	<u>CB-20</u> Verified Synchroscope dial at 12 o'clock. [SAT] [UNSAT]
**11 (3.e)	Close 1A11.	<u>CB-20</u> • Placed Control switch for breaker 1A11 in the AFTER-CLOSE (Red flag) position • Verified RED light ON [SAT] [UNSAT]
**12 (3.f)	Open 1A31.	<u>CB-20</u> • Placed Control switch for breaker 1A31 in the AFTER-TRIP (Green flag) position • Verified GREEN light ON [SAT] [UNSAT]
13 (3.g)	Turn off Synchroscope.	<u>CB-20</u> Turned switch handle in synch switch counter-clockwise. [SAT] [UNSAT]

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

STEP	ELEMENT	STANDARD
14 (3.h)	IF the following condition for Fast Transfer are met, • All lock-outs on CB-20 have amber light on • Appropriate 4160 volt breakers are not in pull-to-lock • Power is available to transfer to THEN place 43/1A1-1A3, Fast Transfer Switch, in AUTO.	<u>CB-20</u> Placed 43/1A1-1A3 in AUTO position [SAT] [UNSAT]
15 (4.a)	Transfer 1A2, Vital Bus, to 22 KV as follows: a. Ensure 43/1A2-1A4, Fast Transfer Switch, is in MANUAL.	<u>CB-20</u> Verified 43/1A2-1A4 in MANUAL position [SAT] [UNSAT]
16 (4.b)	Turn on Synchroscope for 1A22.	<u>CB-20</u> Placed switch handle in synch switch 1A22 and turned clockwise. [SAT] [UNSAT]
17 (4.c)	Verify Incoming and Running voltages are approximately matched.	<u>CB-20</u> Verified voltages on Incoming and Running voltmeters are approximately equal [SAT] [UNSAT]

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

STEP	ELEMENT	STANDARD
18 (4.d)	Verify Synchroscope is approximately at a 12 o'clock position.	CB-20 Verified Synchroscope dial at 12 o'clock. [SAT] [UNSAT]
**19 (4.e)	Close 1A22.	CB-20 • Placed Control switch for breaker 1A22 in the AFTER-CLOSE (Red flag) position • Verified RED light ON [SAT] [UNSAT]
**20 (4.f)	Open 1A42.	CB-20 • Placed Control switch for breaker 1A42 in the AFTER-TRIP (Green flag) position • Verified GREEN light ON [SAT] [UNSAT]
21 (4.g)	Turn off Synchroscope.	CB-20 Turned switch handle in synch switch counter-clockwise. [SAT] [UNSAT]

JPM No: S-8 Rev 3

JPM Title: Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

STEP	ELEMENT	STANDARD
22 (4.h)	IF the following condition for Fast Transfer are met, All lock-outs on CB-20 have amber light on Appropriate 4160 volt breakers are not in pull-to-lock Power is available to transfer to THEN place 43/1A2-1A4, Fast Transfer Switch, in AUTO.	<u>CB-20</u> Placed 43/1A2-1A4 in AUTO position [SAT] [UNSAT]
23	**<u>NOTE</u>** Under certain plant conditions, while supplying all 4160 volt buses, overheat of T1A1 or T1A2 could occur. To minimize this potential, loads between the 2 transformers should be balanced as much as practicable.	Read note. [SAT] [UNSAT]
24 (5)	Balance loads between T1A1 and T1A2 as plant conditions allow.	**EXAMINER CUE: Another Operator will balance loads**

Termination Criteria: Buses 1A1 and 1A2 are powered from 345 KV.

JPM No: S-8 Rev 3

INITIAL CONDITIONS:	**The plant is in hot shutdown following a normal plant shutdown using OP-3A. 345 KV is in service per OI-EG-1. Breaker 3451-4 is not available because substation is correcting a low gas pressure.**

INITIATING CUE:	**You are directed to transfer 4160 V buses 1A1 and 1A2 from 161 KV to 345 KV using OI-EE-1, Attachment 2. Line Dispatch has ensured all Substation Personnel are clear of the breakers.** **All prerequisites are met.**

Attachment 2 - Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

PREREQUISITES (✓) INITIALS

1. Procedure Revision Verification

   Revision No. 28 Date: Today EK

2. 345 KV is in service per OI-EG-1. EK

3. IF Gen G1 is shutdown,
   THEN ensure DS-T1, T1 Disconnect Switch, is open per Attachment 4. EK

4. IF 3451-4 and 3451-5 Breakers are to be operated,
   THEN notify Line Dispatch to ensure all Substation Personnel are clear of breakers. EK

5. The following Turbine Trip Lockout Relays are RESET:

   - 86-1/SVG1 ✓
   - 86-2/SVG1 ✓ EK

PROCEDURE

NOTE
Steps 1 and 2 may be performed in any order.

1. IF open and available,
   THEN close 3451-4 as follows:

   a. Turn on Synchroscope for 3451-4. ___

   b. Verify Synchroscope is approximately at a 12 o'clock position. ___

   c. Close 3451-4. ___

   d. Turn off Synchroscope. ___ ______

2. IF open and available,
   THEN close 3451-5 as follows:

   a. Turn on Synchroscope for 3451-5. ___

Attachment 2 - Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

PROCEDURE (continued) (✓) INITIALS

2

b. Verify Synchroscope is approximately at a 12 o'clock position. ___

c. Close 3451-5. ___

d. Turn off Synchroscope. ___ ______

NOTE

1. Steps 3 through 4 may be performed in any order.

2. If 43/1A1-1A3 is in manual and 1A13 is closed, 1A3 is inoperable.

3. Transfer 1A1, Non-Vital Bus, to 22 KV as follows:

a. Ensure 43/1A1-1A3, Fast Transfer Switch, is in MANUAL. ___

b. Turn on Synchroscope for 1A11. ___

c. Verify Incoming and Running voltages are approximately matched. ___

d. Verify Synchroscope is approximately at a 12 o'clock position. ___

e. Close 1A11. ___

f. Open 1A31. ___

g. Turn off Synchroscope. ___

h. IF the following condition for Fast Transfer are met,

- All lock-outs on CB-20 have amber light on
- Appropriate 4160 volt breakers are not in pull-to-lock
- Power is available to transfer to

THEN place 43/1A1-1A3, Fast Transfer Switch, in AUTO. ___ ______

Attachment 2 - Feed Non-Vital Buses 1A1 and 1A2 From 345 KV

PROCEDURE (continued) (✓) INITIALS

NOTE
If 43/1A2-1A4 is in manual and 1A24 is closed, 1A4 is inoperable.

4. Transfer 1A2, Vital Bus, to 22 KV as follows:

   a. Ensure 43/1A2-1A4, Fast Transfer Switch, is in MANUAL. ___

   b. Turn on Synchroscope for 1A22. ___

   c. Verify Incoming and Running voltages are approximately matched. ___

   d. Verify Synchroscope is approximately at a 12 o'clock position. ___

   e. Close 1A22. ___

   f. Open 1A42. ___

   g. Turn off Synchroscope. ___ ________

   h. IF the following condition for Fast Transfer are met,

      - All lock-outs on CB-20 have amber light on
      - Appropriate 4160 volt breakers are not in pull-to-lock
      - Power is available to transfer to

      THEN place 43/1A2-1A4, Fast Transfer Switch, in AUTO. ___ ________

NOTE
Under certain plant conditions, while supplying all 4160 volt buses, overheat of T1A1 or T1A2 could occur. To minimize this potential, loads between the 2 transformers should be balanced as much as practicable.

5. Balance loads between T1A1 and T1A2 as plant conditions allow. ________

Completed by____Date/Time______/_____

Facility: _Fort Calhoun Station__ Scenario No.: __1_(Spare)___ Revision __1__ Op-Test No.: _______

Examiners: ______________________ Operators: ______________________

Initial Conditions: _100% power, diesel generator #1 is tagged out for maintenance.

Turnover: __Reduce power to <95% per grid operator.

Event No.	Malf. No.	Event Type*	Event Description
1		R-ATCO N-BOPO N-CRS	Reduce power to <95% per OP-4, Attachment 2.
2		I-ATCO TS-CRS	PIC-244 fails, causing HCV-204 (Letdown heat exchanger isolation valve) to close. Alarms are for VCT level low and Pressurizer level high (CB-1,2,3/A2 Window B-2 and CB-1,2,3/A4 Window A-8). If pressurizer level goes >69.2%, **TS 2.1.7** applies.
3		C-ATCO C-BOPO	HCV-153 opens, causing quench tank level to decrease. Alarm is CB-1,2,3/A4 Window C-3. Action will be to restore level and close HCV-153
4		C-BOPO TS-CRS **(CT)**	Inadvertent VIAS. AOP-23 Section IV. **TS 2.15(3)** applies. Critical task is to reset relays that tripped and reset the inadvertent VIAS actuation.
5		C-BOPO TS-CRS	Loss of 161 kV line. Alarm is CB-20/A15, Window A-1, 4160V Supply Breaker from 161KV Tripped, also Windows A-2 and A-3. Since a fast transfer will occur, the ARP states to go to AOP-31. **TS 2.7(2)c and TS 2.01** BOTH apply.
6		M-All	Loss of 345kV line (LOOP) Reactor trips, SRO enters EOP-00 and after SPTA's, transfers to EOP-07, due to below failure. Upon operator manually closing breaker, power will be restored to one vital bus.
7		C-BOPO **(CT)**	AFW valve HCV-1108A remains closed. It can be opened from the control panel. EOP-07 Step 6.1. Critical task is to restore AFW flow using either FW-54 or FW-10 to steam generator RC-2B prior to reaching 27% wide range level.
8		C-BOPO **(CT)**	Diesel Generator #2 breaker fails to close automatically due to diesel not reaching rated speed. When operators increase governor, the output breaker will close once breaker synch conditions are met. See Step 12 of EOP-07. Critical task is to perform this action before exiting EOP-07.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SCENARIO SUMMARY NRC #1

The crew will assume the watch at 100% power, with diesel generator #1 out of service for maintenance, and instructions to downpower to less than 95% per OP-4, LOAD CHANGE AND NORMAL POWER OPERATION, Attachment 2, "Load Reduction".

The first event is the power reduction which will continue until an observable effect on the reactor is seen (approximately 1-2% load reduction).

The next event is a failure of PIC-244 which senses pressure downstream of letdown backpressure control valve. This causes letdown to isolate. Operator actions are per ARP-CB-1,2,3/A2 and require securing charging flow. Operators will use OI-CH-1, CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL OPERATION, to restore letdown and charging after manually overriding the HCV-204 Interlock Override Switch in DEFEAT. SRO will refer to Technical Specifications. **T.S. 2.1.7** might apply if pressurizer level goes above 69.2%.

The next event is a spurious opening of HCV-153, quench tank drain valve, causing quench tank level to decrease. Operator actions are per ARP-CB-1,2,3/A4 and include closing HCV-153 and taking action to restore quench tank level using deaerated water.

The next event is an inadvertent ventilation isolation actuation signal. Operator actions are per ARP-AI-30B/A34-1 and AOP-23 and include verifying that the VIAS was inadvertent and taking actions to reset the relays and reset the actuation (these two steps are **critical tasks**). The SRO will refer to Technical Specifications. **T.S. 2.15(3)** applies.

The next event is a loss of the 161 KV line. Operator actions are per ARP-CB-20/A15 and AOP-31, 161 KV GRID MALFUNCTIONS and include establishing balanced 4160 V bus loading by ensuring that condensate pump FW-2A, feed pump FW-4A and heater drain pump FW-5A are operating. SRO will refer to Technical Specifications. **T.S. 2.7.2(c) and TS 2.01** both apply.

Once actions for the loss of the 161 KV line are complete, there will be a loss of the 345 KV line, resulting in a LOOP. Diesel generator #2 does not reach rated speed and breaker does not automatically close, causing a station blackout. Crew will enter EOP-00 and perform standard post trip actions. Following diagnosis of event, SRO will transition to EOP-07, STATION BLACKOUT.

While performing the actions for a station blackout, the crew should recognize that HCV-1108A failed to open and will must restore AFW flow to the RC-2A steam generator (**critical task**). The crew will also take actions to raise the governor speed for diesel generator #2, which will result in the breaker closing automatically (**critical task**). Once this occurs and diesel generator #2 is feeding its respective bus, the scenario will be terminated.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __1__

Event Description: __Reduce power to less than 95%.

Time	Position	Applicant's Actions or Behavior
	CRS	Enter OP-4, LOAD CHANGE AND NORMAL POWER OPERATION, Attachment 2, "Power Reduction"
	CRS	Ensure prerequisites are met and read notes on page 21.
	CRS	Maximize pressurizer spray. CRS may or may not choose to do this. This step is required if a change in boron concentration of greater than 50 ppm will occur.
	ATCO	Maximize pressurizer spray per OI-RC-7, REACTOR COOLANT SYSTEM PRESSURE CONTROL NORMAL OPERATION, Attachment 4, "Maximum Pressurizer Spray for Mixing) (OP-4, Att. 2, Step 1)
	ATCO	Verify PC-103X pressurizer press controller in automatic (OI-RC-7, Att. 4, Step 1.a)
	ATCO	Ensure proportional heaters bank P1 group 6 and P2 group 7 are in AUTO (OI-RC-7, Att. 4, Step 1.b)
	ATCO	Ensure PCV-103-1, PZR spray valve from loop 2A, and PCV-103-2, PZR spray valve from loop 1B, are in AUTO (OI-RC-7, Att. 4, Step 1.c)
	ATCO	Energize backup heaters by placing each of four control switches { HC-103-3/4/5/6} in ON (OI-RC-7, Att. 4, Step 1.d)
	ATCO	Ensure two spray valves {PCV-103-1 and PCV-103-2} open automatically to terminate pressure rise ((OI-RC-7, Att. 4, Step 1.e)
	ATCO	Adjust PC-103X setpoint pushbuttons to maintain 2100 psia ((OI-RC-7, Att. 4, Step 1.f). Crew may not need to adjust if at current SP.
	CRS	Read Cautions on page 24
	CRS	Direct ATCO and BOPO to lower reactor and turbine load to 95% per step 5.a-g.
	ATCO	Add boric acid per the reactivity plan, PAPeRS guidance, and visual aids on CRS desk as directed by CRS. The CRS may also use OI-CH-4, CHEMICAL AND VOLUME CONTROL SYSTEM MAKEUP OPERATIONS, Attachment 3, "Normal Boration of the RCS" (OP-4, Att. 2, Step 5.g) **Note: validation crew used 90 gallons**
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __1__

Event Description: __Reduce power to less than 95%.______________________________________

Time	Position	Applicant's Actions or Behavior
	ATCO	Reviews prerequisites.
	ATCO	Record information required in Step 1. (OI-CH-4, Att. 3, Step 1)
	ATCO	Determine amount of boric acid to be added and record. (OI-CH-4, Att. 3, Steps 2-3) **Note: validation crew used 90 gallons**
	ATCO	Ensure FCV-269, Makeup Water Control Valve, is in CLOSE. (OI-CH-4, Att. 3, Step 4)
	ATCO	Set FQS-269Y, Boric Acid Makeup Flow Batching Switch to desired amount of boric acid (approx. 90 gal). Record initial totalizer reading. (OI-CH-4, Att. 3, Steps 5-6)
	ATCO	Ensure Boric Acid Pump Recirculation Valves, HCV-264, HCV-257 are closed. (OI-CH-4, Att. 3, Step 7)
	ATCO	Place HC-269, Makeup Water Mode Select Switch, in BORATE. (OI-CH-4, Att. 3, Step 8)
	ATCO	Open FCV-269. (OI-CH-4, Att. 3, Step 9)
	ATCO	Place FCV-269Y, Boric Acid Makeup Flow Control Valve, in AUTO. (OI-CH-4, Att. 3, Step 10)
	ATCO	Use FC-269Y, Boric Acid Makeup Flow Controller, to set boric acid flow to desired flow rate. (OI-CH-4, Att. 3, Step 11)
	ATCO	Verify VCT level and pressure respond as expected. (OI-CH-4, Att. 3, Step 12)
	ATCO	When boration is complete, place FCV-269Y in CLOSE. Close FCV-269. Place HC-269 in DILUTE. (OI-CH-4, Att. 3, Steps 14-15)
	BOPO	Lower Turbine Generator Load to maintain RCS T_{AVE} program per TDB Figure III.1. (OP-4, Att. 2, Step 5.a) **Examiner note: Double arrows on digital turbine screen are 0.5 degrees of change while single arrows are 0.2 degrees of change.**
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __1__			Page _6__ of _17__
Event Description: __Reduce power to less than 95%.______________________________________			

Time	Position	Applicant's Actions or Behavior
	ATCO	Maintain pressurizer level within 4% of programmed level per OI-RC-8. Level control in automatic. No operator action required. (OP-4, Att. 2, Step 5.c)
	ATCO	Maintain pressurizer pressure 2075-2150 PSIA per OI-RC-7. Pressure control in automatic. No operator action required (OP-4, Att. 2, Step 5.d)
	BOPO	Maintain steam generator levels at 55-75% NR per OI-FW-3. Level control in automatic. No operator action required (OP-4, Att. 2, Step 5.e)
	ATCO	Maintain ASI per OI-RR-1, REACTOR REGULATING SYSTEM NORMAL OPERATION, Attachment 4, "ASI Control" (OP-4, Step 5.f) or the crew may use Attachment 3. Also may use PAPeRS guidance.
	ATCO	Review prerequisites.
	ATCO	Use group 4 CEAs to control ASI. Insert CEAs to make ASI more positive. Withdraw CEAs to move ASI negative. When inserting rods, take mode select switch to MS, drive Group 4 rods in the desired amount (approx 4 inches), mode select switch to OFF. (OI-RR-1, Att. 4, Step 1)
	ATCO	Maintain ASI per TDB Figure III.23.a. (-0.01 to + 0.01) (OI-RR-1, Att. 4, Step 2)
		If crew uses OI-RR-1, Attachment 3:
	ATCO	Review Notes.
	ATCO	Ensure an out-of-scan CEA is not selected as the target rod on CB-4. (OI-RR-1, Attachment 3, Step 1)
	ATCO	Verify REGULATING GROUP WITHDRAWAL PROHIBIT is clear. (Step 2)
	ATCO	Place Rod Control Mode Selector Switch in Manual Sequential position. (Step 3)
	ATCO	Review Note.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __1__ Page _7__ of __17_		
Event Description: __Reduce power to less than 95%.______________________________________		

Time	Position	Applicant's Actions or Behavior
	ATCO	Place Manual Rod Control Switch to LOWER, then verify the following (Step 4): • Primary CEAPIS indicates motion in the proper direction • Secondary CEAPIS indicates motion in the proper direction • ERF (Page 302 or LPP) indicates motion in the proper direction
	ATCO	Verify the following group motion overlap (Step 5.b): • Group 3 starts when Group 4 is at 53 inches **Note: This will not be reached during this downpower.**
	ATCO	When the group is at the desired position, release Manual Rod Control Switch (Step 7).
	ATCO	Verify all CEA motion stops as indicated by the following (Step 9): • Primary CEAPIS • Secondary CEAPIS • ERF (Page 302 or LPP)
	ATCO	Place Rod Control Mode Selector Switch in OFF. (Step 11)
		Next event is cued at Lead Examiner's discretion once a reactivity effect is seen.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __2__

Event Description: PIC-244 fails high, causing HCV-204 to close, isolating letdown.

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarms CB-1,2,3/A2 Window B1L, INTERMEDIATE LETDOWN PRESSURE HI-LO, and CB-1,2,3/A2, A1L, RELIEF VALVE CH-223 DISCHARGE TEMPERATURE HI
	ATCO	Enter ARP-CB-1,2,3/A2 Window A1L
	ATCO	Check TIA-205 Letdown Relief Line Temperature (Step 1)
	ATCO	Ensure TCV-202 and HCV-204 are closed. (Step 2)
	ATCO	Monitor TIA-205 to verify CH-223 and verify temperature is trending down. (Step 2.1)
Booth Cue when called as field operator such as Water Control Operator: The linkage is broken and will need EM to repair.		
	ATCO	Place HC-204-1, Letdown Flow HCV-204 Interlock Override SW-1, in DEFEAT. (Step 2.2)
Lead Examiner note: If the crew chooses not to put HC-204-1 SW-1 in DEFEAT, then have the booth call as SM to direct them to do it. Not performing this step correctly is a failure to follow the procedure as written.		
	ATCO	Restore letdown to service per OI-CH-1. (Step 2.3) **Examiner note: Once the crew reaches this point do not allow them to continue to restore letdown-this takes too long for this scenario.**
	CRS	**TS 2.1.7** might apply if pressurizer level gets above 69.2%.
		Next event is initiated at Lead Examiner direction.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __3__

Event Description: HCV-153 opens, causing quench tank level to decrease.

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A4 Window C-3, QUENCH TANK LEVEL HI-LO
	ATCO	Enter ARP-CB-1,2,3/A4 Window C-3
	ATCO	Check pressurizer quench tank level on LIA-132 or L132, ERF. (Step 1)
Booth note: CRS may call work week manager for help.		
	ATCO	Restore PQT Level per OI-RC-6, PRESSURIZER QUENCH TANK NORMAL OPERATION. (Step 2)
	BOPO/ATCO	Open dearated water header isolation valves HCV-1560A and 1560B. (OI-RC-6, Attachment 1, Step 1)
	ATCO	Monitor PIA-131, Pressurizer Quench Tank pressure. (Step 2)
	ATCO	Open quench tank vent valve, HCV-155, as necessary to maintain pressure less than 10 psig. (Step 3)
	BOPO/ATCO	When filled to desired level (typ. 73%), close HCV-1560A, HCV-1560B. (Step 4)
	ATCO	Check for leakage from PQT to RCDT and/or containment sump. (ARP-CB-1,2,3/A4, Window C-3, Step 2.1)
	ATCO	Determine that the quench tank drain valve, HCV-153 is open.
	ATCO	Close HCV-153. (OI-RC-6, Attachment 2, Step 5)
		Next event is cued at Lead Examiner direction

Op-Test No.: _____ Scenario No.: _1__ Event No.: __4__			Page _10__ of _17__
Event Description: Inadvertent Ventilation Isolation Actuation Signal.			

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm AI-30B/A34-1 Window C-2, VENTILATION ISOLATION COMMAND.
	BOPO	Enter ARP- AI-30B/A34-1 Window C-2.
	BOPO	Verify 86B/VIAS is tripped. Verify valves isolated by VIAS are closed. (Step 1)
	BOPO	Verify that none of the following relays are tripped: 86B/CRHS, 86B/SIAS, 86B/CSAS. (Step 2)
	CRS	Direct entry into AOP-23, RESET OF ENGINEERED SAFEGUARDS, Section IV, "Reset of Containment Isolation Actuation Signal (CIAS) and Ventilation Isolation Actuation Signal (VIAS)
	BOPO	Verify VIAS is inadvertent: No PPLS, CPHS, SIAS, or CSAS. RM-051, RM-052, RM-062 not in alarm. (AOP-23, Section IV, Step 1)
	BOPO	Ensure BOTH emergency operate "THINK" switches, SE-A and SE-B, are in "NORM". (AOP-23, Section IV, Step 2)
	BOPO	Ensure all RCP Coolers CCW valves are open. (AOP-23, Section IV, Step 3)
	BOPO	Ensure hand controller thumbwheel is set fully counter-clockwise for any of the following valves that are open: HCV-400C, HCV-401C, HCV-402C, HCV-403C. (AOP-23, Section IV, Step 4) **Examiner note: 400C and 401C are currently throttled open for containment cooling and the crew may choose to leave them in this position.**
	BOPO	Ensure relays are reset: 86A/CIAS, 86B1/CIAS, 86B/CIAS, 86A1/CIAS. (AOP-23, Section IV, Step 5)
	BOPO	Ensure 86/AI-43A, 86/AI-43B are reset. (AOP-23, Section IV, Step 6)
	BOPO	Ensure detector well cooling by opening HCV-467A, B, C, D, and starting any detector well cooling fan. (AOP-23, Section IV, Step 7)
	BOPO	Ensure 86A/CRHS, 86B/CRHS, 86B1/CRHS, and 86A1/CRHS reset. (AOP-23, Section IV, Steps 8-9)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __4__ Page _11__ of _17__		
Event Description: Inadvertent Ventilation Isolation Actuation Signal.		

Time	**Position**	**Applicant's Actions or Behavior**
	BOPO **(CT)**	Ensure 86A/VIAS, 86B1/VIAS, 86B/VIAS, and 86A1/VIAS reset. (AOP-23, Section IV, Step 10) **Examiner note: The 86B/VIAS must be reset, the others are in the correct position**
	BOPO **(CT)**	Depress both 94A/VIAS-RESET and 94B/VIAS-RESET pushbuttons. (AOP-23, Section IV, Step 11)
	BOPO	Complete Attachment D, "Equipment Operated by VIAS". (AOP-23, Section IV, Step 13)
	TS-CRS	Enter **TS 2.15(3)** for loss of isolation logic subsystem : Restore to operable status within 48 hours or placed in hot shutdown within the following 12 hours; operation can continue without containment ventilation isolation signals available if ventilation isolation valves are closed.
		Next event is cued at Lead Examiner's direction.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __5__

Event Description: Loss of 161 kV line.

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarms: CB-20/A15 Windows A-1, BREAKER 111 TRIPPED, Window A-2, 161 KV SUPPLY BKR LOCKOUT RELAY OPERATED 86/161, Window A-3, BREAKER 110 TRIPPED
	BOPO	Enter ARP-CB-20/A15, Windows A-1, A-2, A-3 (all have the same actions)
	BOPO	Notify Energy Marketing and Shift Manager. (ARP-CB-20/A15 A-3, Step 2)
Booth Cue when called as Energy Marketing: "The 161 kV line has been lost and there is no estimate for its return."		
	BOPO	Verify Fast Transfer has occurred and go to AOP-31. (Step 3.1)
	CRS	Enter AOP-31, 161 KV GRID MALFUNCTIONS, Section II, "All 4160 V Buses Fed from 22 KV"
	CRS	Ensure 2 condensate pumps, 2 feed pumps, and 2 heater drain pumps are operating. (AOP-31, Step 1)
	BOPO	Adjust main generator terminal voltage less than 22,000 volts per the following: N/A. (Step 2)
	BOPO	Establish balanced 4160 V bus loading on T1A1 and T1A2 by ensuring all the following are operating: condensate pump FW-2A, feed pump FW-4A, and heater drain pump FW-5A. (Step 3)
	BOPO	Start Heater Drain Pump, FW-5A (Step 3)
	BOPO	Verify voltage is greater than 430 volts on all the following buses: 1B3A, 1B3B, 1B3C, 1B4A, 1B4B, 1B4C. If not, refer to attachment A to determine loads to realign. (Step 4)
	CRS	Notify NRC of loss of 161 KV within 4 hours. (Step 5)
	BOPO	Match flags on following breakers: 110, 111, 1A31, 1A33, 1A42, 1A44. (Step 6)
	CRS	Enter **TS 2.7.2(c)** for loss of 161 kV line inop-ing both house service transformers. May be inoperable for up to 72 hours, after which it must be placed in a hot shutdown condition within following 12 hours. Notify NRC Operations Center by phone within 4 hours of inoperability of transformers. Enter **TS 2.01** because a loss of 161kV and one EDG OOS (#1) concurrently, therefore this TS is required.
		Next event is cued at Lead Examiner's direction. Events 7 and 8 are preprogrammed and need not be cued.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __6,7,8__ Page _13__ of _17_

Event Description: Loss of 345 kV line. Failure of diesel generator #2 to reach rated speed, so breaker does not automatically close, causing a station blackout. AFW valve HCV-1108A remains closed but can be opened from the control panel.

Time	Position	Applicant's Actions or Behavior
	CRS	Enter EOP-00, STANDARD POST TRIP ACTIONS
	ATCO BOPO	Respond to reactor trip. Perform SPTA's, EOP-00, STANDARD POST TRIP ACTIONS
	ATCO	Verify reactivity control established: reactor power is lowering, startup rate is negative, no more than 1 regulating or shutdown CEA not inserted, and monitor for uncontrolled RCS cooldown (EOP-00 Step 1)
	BOPO	Verify turbine tripped as indicated by stop and intercept valves indicating closed. (EOP-00, Step 2)
	BOPO	Ensure all of the following generator breakers tripped: output breakers 3451-4, 3451-5, and field breaker 41E/G1F. (EOP-00 Step 3)
	BOPO	Verify buses 1A3 and 1A4 energized (EOP-00 Step 4). Transition to contingency column.
	BOPO	Minimize DC loads per attachment 6. Ensure diesel generator is started for affected bus (EOP-00 Step 4.1).
	BOPO	Direct an auxiliary operator to perform the following:
	BOPO	Place DC Bus 2 breakers EE-8G-CB12, "400 Cycle Inverter EE-21" and EE-8G-CB8, "Emergency Lighting Pnl ELP-2 Transfer Switch" in "OFF" (EOP Attachment 6, Step 1.a)
	BOPO	Place DC Bus 1 breaker EE-8F-CB11, "Aux Bldg Emgy Lighting Panel ELP-1" in "OFF" (EOP Attachment 6, Step 1.b)
	BOPO	Place 125 VDC Panel DC-PNL-1, Breaker 15, "ELP-5 Emergency Lighting Panel" in "OFF" (EOP Attachment 6, Step 1.c)
	BOPO	Vent hydrogen from generator using G-03, Generator ST-2 Vent Header Isolation Valve" behind AI-134 (EOP Attachment 6, Step 2)
	BOPO	Check that Buses 1A1 and 1A2 are energized (EOP-00 Step 6). No contingency actions.
	BOPO	Check that 125 VDC buses 1 and 2 are energized. (EOP-00, Step 7)
	BOPO	Verify instrument air is available by both of the following: IA pressure greater than or equal to 90 psig and at least one air compressor running (EOP-00, Step 8) Contingency action is to restore instrument air, but no power at this time to run the pump or compressor.
		Events description continued on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __6,7,8__

Event Description: Loss of 345 kV line. Failure of diesel generator #2 to reach rated speed, so breaker does not automatically close, causing a station blackout.

Time	Position	Applicant's Actions or Behavior
	ATCO	Determine normal CCW system operation: At least one CCW pump operating, CCW pump discharge pressure is greater than or equal to 60 psig, at least one RW pump is operating, and RCP coolers CCW valves HCV-438A/B/C/D are open if CCW pump discharge pressure is greater than 40 psig (EOP-00 Step 9). Transition to contingency action.
	ATCO	Contingency action is to stop RCP's which has already occurred. (EOP-00 Step 9.1)
	ATCO	Verify all of the following: PZR level 30-70%, trending to 45-60%, RCS subcooling greater than or equal to 20°F. (EOP-00, Step 10)
	ATCO	Verify all of the following: RCS pressure 1800-2300 psia, trending to 2050-2150 psia, and PORV's are closed. (EOP-00, Step 11) **Note: Because level and pressure are slowly lowering due to RCP seal leakoff, crew may enter contingency actions for this step, which check for a PORV open, verify ESF if pressure <1600 psia, trip 1 RCP in each loop if pressure <1350 psia, and manually control sprays and heaters to maintain pressure.**
	ATCO	Verify forced circulation with at least one RCP operating, transition to contingency column (EOP-00, Step 12)
	BOPO	Place TCV-909 temperature controller in manual (DCS, Secondary/MS/SD&B Control. (EOP-00, Step 12.2.a)
	BOPO	Ensure TCV-909 temperature controller output is zero. (EOP-00, Step 12.2.b)
	ATCO	Verify development of natural circulation flow in at least one loop by all of the following: Core ΔT less than or equal to 50°F, difference between CETs and RCS T_H is less than or equal to 10°F, RCS subcooling greater than or equal to 20°F, and T_H and T_C are stable or lowering. (EOP-00, Step 12.2.b)
	BOPO	Verify Main Feedwater is restoring level in at least one steam generator (EOP-00, Step 13). Transition to contingency step 13.1.b, c, d, or e.
	BOPO **(CT)**	**Critical Task is to perform one of the next four steps to restore AFW flow using either FW-54 or FW-10 to steam generator RC-2A prior to reaching 27% wide range level.**
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __6,7,8__		Page __15_ of _17_
Event Description: Loss of 345 kV line. Failure of diesel generator #2 to reach rated speed, so breaker does not automatically close, causing a station blackout.		

Time	Position	Applicant's Actions or Behavior
	BOPO	Initiate AFW using diesel driven AFW pump to Feed Ring (EOP-00, Step 13.1.b) 1) Start FW-54. 2) Restore level in at least one S/G to 35-85% NR. **OR**
	BOPO	Initiate AFW using FW-10, AFW pump to AFW nozzle (EOP-00 Step 13.1.c) 1) Start FW-10 2) Restore level in at least one S/G to 35-85% NR. **OR**
	BOPO	Initiate AFW using FW-10 AFW pump to Feed Ring by starting FW-10 and opening HCV-1383, "Aux FW/FW Header Cross Connect Valve" (EOP-00, Step 13.1.d) **OR**
	BOPO	Initiate AFW using FW-54, diesel AFW pump, to AFW nozzles by starting FW-54, directing an auxiliary operator to unlock and close FW-170, "Aux Feedwtr X-Tie Vlv HCV-1384 Outlet Valve", and opening HCV-1384, "Aux FW/FW Header Cross Connect Valve" (EOP-00, Step 13.1.e)
		Note: Crew may decide to use an override on the Main FW regulating bypass valves, which allows the use of an accumulator to hold these valves completely open (cannot throttle). This action would allow FW-54 to continue to feed directly into the steam generators through the MFW line (Step 13.1.b), since a SBO causes a loss of instrument air, resulting in these valves drifting closed. This would keep the operators from having to realign FW-54 to go through the AFW nozzles (and needing to reopen HCV-1108A). However, the override of the feed reg bypass valves is NOTproceduralized in the EOP.
	BOPO	Verify Steam Dump and Bypass valves are controlling RCS T_C 525-535°F and steam generator pressure 850-925 psia (EOP-00 Step 14). Transition to contingency action 14.c.
	BOPO	Operate at least one of the air assisted main steam safety valves MS-291 and/or MS 292 (EOP-00, Step 14.c)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __6,7,8__	Page __16_ of _17_
Event Description: Loss of 345 kV line. Failure of diesel generator #2 to reach rated speed, so breaker does not automatically close, causing a station blackout.	

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify normal containment conditions: no unexpected rise in sump level; no containment area radiation monitor alarms; RM-051, RM-052, and RM-062 not in alarm; no steam generator blowdown or condenser off gas radiation monitors in alarm or trending upward; containment pressure less than 3 psig; and containment temperature less than 120°F. (EOP-00, Step 15)
	CRS	Determine that EOP-07 should be implemented per EOP-00 Section 6.0 (EOP-00, Step 16)
	CRS	Enter EOP-07, STATION BLACKOUT
	CRS	Confirm SPTA's performed (EOP-07, Step 1)
	CRS	Confirm SBO diagnosis by verifying safety function status check (EOP-07, Step 2)
	CRS	Implement the Emergency Plan (EOP-07, Step 3)
	ATCO/BOPO	Monitor the Floating Steps (EOP-07, Step 4)
	BOPO	If condenser vacuum less than 19 inches Hg, ensure steam dump and bypass valves and turbine stop valves are closed. (EOP-07, Step 5)
	BOPO	If feeding through Feed Rings, verify S/G levels 35-85% NR (EOP-07, Step 6) **OR**
	BOPO **(CT)**	**(CT) restore AFW flow using either FW-54 or FW-10 to SG RC-2A prior to reaching 27% wide range level.** If feeding through AFW nozzles, maintain S/G level 35-85% NR by ensuring FW-10 operating, both AFW isolation valves, HCV-1107A and HCV-1108A are open, and locally throttle both AFW isolation valves HCV-1107B and HCV-1108B. (EOP-07, Step 6.1) **Note: These actions and the action to open HCV-1108A may already have been completed in EOP-00.**
	BOPO	Maintain S/G pressure 850-1000 psia by performing EOP-07, Step 7.a, or c (Step B has local operator actions)
	BOPO	Steam S/G's by ensuring MS-164 "Main Steam Line "A" Steam Dump to Atmosphere Isolation Valve" is open (local action), ensure MS-407, "Atmospheric Dump Valve HCV-1040 2nd Isolation" is open (local action), and control HCV-1040, Atmospheric Dump Valve. (EOP-07, Step 7.a) **OR**
	BOPO	Operate FW-10, Steam AFW pump (EOP-07, Step 7.c)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _1__ Event No.: __6,7,8__		Page __18_ of _17_
Event Description: Loss of 345 kV line. Failure of diesel generator #2 to reach rated speed, so breaker does not automatically close, causing a station blackout.		

Time	Position	Applicant's Actions or Behavior
	BOPO	Trip all of the following normal and standby supply feeder breakers to the vital 4160V buses: 1A13, 1A33, 1A24, 1A44. (EOP-07, Step 8)
	BOPO	Ensure all the following breakers tripped: CW-1C (circ water pump), FW-5C (heater drain pump), FW-2C (condensate pump), FW-6 (electric AFW pump), FW-4C (feed pump), RC-3C (RCP), RC-3D (RCP), AC-10A/B/C/D (raw water pumps), SI-1A/B (LPSI pumps) (EOP-07, Step 9)
	BOPO	Verify both diesels started. (Maintenance on DG#1 will preclude emergency start) (EOP-07, Step 10)
	BOPO **(CT)**	**If D-2 is operating and none of the following lockout relays are tripped: 86/1A24, 86/1A44, 86/1A4-TFB, then synchronize and close breaker 1AD2 (EOP-07, Step 12)**
	CRS	Direct exit from EOP-07 and entry into EOP-02, LOSS OF OFF-SITE POWER/LOSS OF FORCED CIRCULATION (EOP-07, Step 13)
		Scenario is terminated after successful transition from EOP-07 is made.

Procedure Number	Procedure Title	Revision
OP-4	LOAD CHANGE AND NORMAL POWER OPERATION	48
OI-RC-7	REACTOR COOLANT SYSTEM PRESSURE CONTROL NORMAL OPERATION	17
OI-CH-4	CHEMICAL AND VOLUME CONTROL SYSTEM MAKEUP OPERATIONS	45
OI-RR-1	REACTOR REGULATING SYSTEM NORMAL OPERATION	29
ARP-CB-1,2,3/A2		38
OI-CH-1	CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL OPERATION	88
ARP-CB-1,2,3/A4		30
OI-RC-6	PRESSURIZER QUENCH TANK NORMAL OPERATION	12
ARP-AI-30B/A34-1		25
AOP-23	RESET OF ENGINEERED SAFEGUARDS	9
ARP-CB-20/A15		40
AOP-31	161 KV GRID MALFUNCTIONS	11
EOP-00	STANDARD POST TRIP ACTIONS	29
	EOP/AOP ATTACHMENTS	32
EOP-07	STATION BLACKOUT	14

Scenario # 1 Malfunction List – Rev1

Event #	Description	Type	System	Command	Severity	Ramp
1	Power Reduction	normal				
2	PIC 244 Fails	BIST	CVC	CVC_PIC244_C	TRUE	
3	Quench tank drain down	Op action	WDL	Operator Mode open HCV-153		
4	Inadvertent VIAS	MALF	ESF	ESF18	TRIP	
5	Loss of 161 KV	MALF	SWD	SWD02	TRUE	
6	Loss of 345 KV	MALF	SWD	SWD01	TRUE	
7	HCV-1108A failed closed (Preset)	VLV	AFW	FWC_HCV1108A	0%	
8	DG-2 breaker does not close (Preset)	Run governor down until 500 RPM light. Replace bulb with burned out bulb				

Facility: _Fort Calhoun Station__ Scenario No.: __2____ Revision __1__ Op-Test No.: _______

Examiners: ______________________________ Operators: ______________________________

Initial Conditions: 100% power. Condensate pump FW-2B is currently in service

Turnover: _____. Rotate condensate pumps FW-2B and FW-2C.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N-BOPO	Rotate condensate pumps FW-2B and FW-2C per OI-FW-1 Attachment 4.
2		C-ATCO TS-CRS	Charging pump CH1B trips. Alarm CB-1,2,3/A2, Window A-6L. This isolates letdown. Another charging pump should be started per OI-CH-1. **T.S. 2.15(5)** applies because it requires CH-1B and other instruments for AI-179 (Alt shutdown panel)
3		I-BOPO	LT-903Y (Steam generator RC-1 level transmitter) degrades over a 10 minute period until it fails. This will shift FWCS to manual at the last good signal, requiring operator action to restore level. Alarm is ARP-DCS-FW, L0903E_AL5.
4		I-ATCO TS-CRS	Pressurizer pressure instrument fails high. Possible **TS 2.10.4(5)** if pressure falls below 2075 psia. Uses ARP-CB-1,2,3/A4 Window B-4 Pressurizer Pressure Deviation
5		C-ATCO C-BOPO TS-CRS	Dropped CEA 4-01. Alarm CB-4/A8 Window A-5L. This will send the operators to AOP-02, which has actions to stabilize the plant. **TS 2.10.2(4)(e)** Section III applies because the rod is dropped, this will require a rapid down-power per AOP-05.
6	N/A	R-ATCO N-BOPO	Rapid down-power per AOP-05.
7		M-All	RCP Seal Cooler Leak of CVC16. Due to high RCP temperatures, AOP-35 will be entered. AOP-35 will direct the operators to trip the reactor and enter EOP-00. This is an intersystem LOCA. EOP-03 will be entered after SPTA's are performed. TS 2.1.4(3) applies but is not counted because it is part of the major event and per the NUREG may be over-shadowed by it.
8		C-BOPO **(CT)**	Turbine fails to trip. Critical task is for BOP to immediately trip the turbine before performing other SPTA's
9		C-ATCO C-BOPO **(CT)**	HCV-438C fails to close on demand. This LOCA cannot be isolated. It will require a cooldown and depressurization to stop the LOCA. Critical task is to lower RCS pressure before attempting to locally close HCV-438C.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SCENARIO SUMMARY NRC #2

The crew will assume the watch at 100% power with no equipment out of service and instructions to swap condensate pumps FW-2B and FW-2C.

The first event is swapping out the two condensate pumps per OI-FW-1, CONDENSATE SYSTEM NORMAL OPERATION, Attachment 4.

The next event is a trip of charging pump CH-1B, which secures charging flow. Operator actions are per ARP-CB-1,2,3/A2 and include securing letdown. Operator action is then to restore charging and letdown per OI-CH-1, CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL OPERATION. SRO will refer to the Technical Specification. **T.S. 2.15(5)** applies for the loss of CH-1B.

The next event is a degradation of LT-903Y to 40% over a 10 minute period before failing low, resulting in an incorrect setting on the feedwater digital control system. Operator actions are per ARP-DCS-FW, L0903E_AL5 and include the operator taking manual control of the main feed regulating valve to restore steam generator levels to program.

The next event is the controlling pressurizer pressure instrument, PT-103X failing high. Operator actions are per ARP-CB-1,2,3/A4 and include taking the controller to manual to maintain pressurizer pressure, and shifting pressure control to PC-103Y. SRO will refer to Technical Specifications. **T.S. 2.10.4(5)(a)(ii)** applies if pressure falls below 2075 psia.

The next event is a CEA drop of CEA 4-01. Operator actions are per ARP-CB-4/A8 and AOP-02, CEA AND CONTROL SYSTEM MALFUNCTIONS and include stabilizing the plant and taking action to lower reactor power to less than or equal to 70% ΔT within 1 hour per AOP-5, EMERGENCY SHUTDOWN. SRO will refer to Technical Specifications. **T.S. 2.10.2(4)(e)** applies.

Once actions have been taken to start lowering reactor power to less than 70%, a 100% severity RCP seal cooler leak on CVC 16 will be cued. Operator actions are from ARP-CB-1,2,3/A1 and AOP-35, REACTOR COOLANT PUMP MALFUNCTIONS. At this time one of the bearing temperatures will exceed the trip criteria for the RCP. Operators will manually trip the reactor and enter EOP-00. They will also trip the RCP whose trip criteria was exceeded (RCP 3A).

When the operators manually trip the reactor, the turbine will fail to trip and the operators will take action to manually trip the turbine (**critical task**). After actions of EOP-00 are complete, the SRO will direct entry into EOP-03 for a loss of coolant accident.

When operators attempt to isolate the leak by closing HCV-438C, it fails to close. Operators must commence a cooldown and depressurization prior to sending a local operator to close this valve (**critical task**). TS 2.1.4(3) applies but is not counted because it is part of the major event and per the NUREG may be over-shadowed by it.

The scenario can be terminated once actions have begun to cooldown and depressurize the RCS to allow local operator action to close HCV-438C.

Op-Test No.: _____ Scenario No.: __2___ Event No.: __1___ Page _3__ of _16__

Event Description: ___Rotate condensate pumps FW-2B and FW-2C.________________

Time	Position	Applicant's Actions or Behavior
	BOPO	Review OI-FW-1, CONDENSATE SYSTEM NORMAL OPERATION, Attachment 4, "Rotating Condensate Pumps" prerequisites.
	BOPO	Select condensate pump to be started (in this case, FW-2C). (OI-FW-1, Att. 4, Step 1)
	BOPO	Suspend GARDEL data feed IAW OI-ERFCS-2, CORE MONITORING SYSTEMS, Att. 6, "Suspending GARDEL Data Feed" (Step 2) NOTE: GARDEL is NOT modeled in the simulator, so these steps will not be performed.
If asked, the booth/lead examiner reports back to the crew as STA that Gardel is suspended.		
	BOPO	Review CAUTIONS.
	BOPO	Perform the following: ensure 43/FW switch in off and verify 43/FW Transfer Switch Off-Auto (CB-10,11/A10, B-6L) is in alarm. (Step 3)
	BOPO	Review NOTE.
	BOPO	Start condensate pump FW-2C. (Step 4)
	BOPO	Verify ammeter returns to less than 250 amps in less than 15 seconds and stabilizes (Step 5)
	BOPO	Ensure condensate pump minimum flow maintained by verifying discharge pressure 490-600 psig. If recirculation valve FCV-1172 is not operating properly, then establish minimum flow by opening FCV-1172 bypass valve, FW-273 (Step 6) **Note: These are local valves.**
	BOPO	Monitor FW-2C for any the following: unusual noise or vibration, lube oil level, seal water inlet pressure (**70-90 psig on PI-1214**), FW-2C discharge pressure (**490-600 psig on PI-1232C at pump**), FW-2C discharge pressure (490-600 psig on PI-1181C in CR), check ERF computer points. ERF points are F1172, T1179A, T1179B, T1184C, T1185C. (Step 7) **Note: Bold values are local operator cued values (local parameters).**
	BOPO	Stop FW-2B (Step 8)
	BOPO	Review NOTE.
	BOPO	Place FW-2B in AFTER-STOP or PULL-STOP (Step 9) (optional)
	BOPO	Verify FW-2B ammeter drops to zero (Step 10)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: __2___ Event No.: __1___

Event Description: ___Rotate condensate pumps FW-2B and FW-2C.________________

Time	Position	Applicant's Actions or Behavior
	BOPO	Observe check valve closure by verifying FW-2B not rotating in reverse direction (Step 11) – a local operator action.
	BOPO	Ensure Post-SIAS/CSAS running condensate pump switch 43-SIAS/FW2 is positioned to FW-2C. (Step 12)
	BOPO	Place 43/FW Switch in AUTO and verify alarm clears (Step 13)
	BOPO	Restore GARDEL data feed IAW OI-ERFCS-2, Attachment 7, "Restoring the GARDEL Data Feed" (Step 14) NOTE: GARDEL not modeled in simulator, so these steps will not be performed.
If asked, the booth/lead examiner reports back to the crew as STA that Gardel is restored.		
		Lead examiner cues the next malfunction at his/her discretion. **Booth should also enter the Event 3 malfunction at this time (LT-903Y degrades to 40% over 10 minute period before failing low)**

Op-Test No.: _____ Scenario No.: __2___ Event No.: __2___

Event Description: Charging pump CH-1B trips.

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A2 Window A-6L, CHARGING FLOW LO, and Window C-6U, CHARGING PUMPS TRIP
	ATCO	Enter ARP CB-1,2,3/A2, Window A-6L
	ATCO	Check charging header flow on FIA-236 (ARP-CB-1,2,3/A2, A-6L, Step 1)
	ATCO	If charging flow lost, then isolate letdown by closing TCV-202 and HCV-204 (Step 2)
	ATCO	If charging flow is less than 30 gpm, then check charging pump operation, valve alignment, pipe break, and charging pump discharge or suction relief valve. (Step 3)
Note: If called, booth role-plays that the CH-1B breaker has an overcurrent trip.		
	ATCO	Rotate charging pumps per OI-CH-1, CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL OPERATION, Att. 1, "Startup of Charging and Letdown" (Step 4)
	ATCO	Crew may decide to put CH-1B in Pull-to-lock.
	ATCO	Review prerequisites for restoring charging at letdown (OI-CH-1, Att. 1)
	CRS	Enter TS 2.15(5) for loss of CH-1B and controls for AI-185 Restore in 7 days or be in hot shutdown within next 12 hours.
	CRS	Ensure compliance with SO-O-23, SYSTEMS AND EQUIPMENT USAGE DATA. (ARP-CB-1,2,3/A2, A6L, Step 7)
		Lead examiner cues the next malfunction at his/her discretion.

Op-Test No.: _____ Scenario No.: __2___ Event No.: __3___ Page _6__ of _16__

Event Description: ___LT-903Y degrades to 40% over 10 minute period before failing low. This malfunction should be entered with the charging pump trip.

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm DCS-FW, L0903E_AL5 and H1105_AL1
	BOPO	Enter ARP-DCS-FW, L0903E_AL5 or FWR-CTL-XX-BD, LY903_BD.
	BOPO	Ensure FWCS IN MANUAL is displayed for bad channel on feedwater regulating system display (Step 2)
	BOPO	Control steam generator level by either selecting OUT (ie bypassing) on level controller LC0903_1E and adjusting as necessary to control feed reg or bypass valves to maintain levels, **OR** take manual control of feed reg or bypass valves and adjust as necessary to maintain steam generator levels (Step 4).
	BOPO	Dispatch operator to verify level indication at AI-179. Level indication at AI-179 is not affected by this failure. (Step 6)
	CRS	Reference TDB-VIII, EQUIPMENT OPERABILITY GUIDANCE. (Step 7)
	BOPO	Notify system engineer and I&C of alarm condition. (Step 8)
		Lead examiner cues the next malfunction at his/her discretion.

Op-Test No.: _____ Scenario No.: _2__ Event No.: __4__ Page _7__ of __16_
Event Description: Controlling pressurizer pressure instrument, PT 103X fails high.

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A4 Window A-4 PRESSURIZER PRESSURE OFF NORMAL HI-LO CHANNEL X.
	ATCO	Enter ARP-CB-1,2,3/A4 Window A-4.
	CRS	Apply T.S. 2.10.4(5)(a)(ii) if pressure is less than or equal to 2075 psia. (Step 2.1)
	ATCO	Check pressurizer heaters are energized. (Step 2.2)
	ATCO	Ensure pressurizer spray valves are closed. (Step 2.3)
	ATCO	Ensure pressurizer heater control switches are in AUTO (Step 2.4)
	ATCO	Check pressurizer level for decreasing trend (Step 2.5)
	ATCO	Check VCT level for level trend (Step 2.6)
	ATCO	Monitor pressurizer pressure and the operation of PC-103X. (Step 4)
	ATCO	If PC-103X is not controlling pressure, shift pressure control to PC-103Y (Step 4.1)
	ATCO	If necessary, take manual control of pressurizer pressure. (Step 4.2)
	TS-CRS	Possible technical specification call depending on how low pressurizer pressure falls before ATCO takes action. TS 2.10.4(5)(a)(ii) if pressure falls below 2075 psia.
	CRS	Notify Work Week manager of failure.
		Lead examiner cues the next malfunction at his/her discretion.

Op-Test No.: _____ Scenario No.: _2__ Event No.: __5, 6__			Page _8__ of _16__
Event Description: CEA 4-01 drop, requiring a rapid downpower using AOP-05.			

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-4/A8, Window A-5L, DROPPED ROD, Window B-1U, ROD POSITION DEVIATION LOW LIMIT, Window B-1L, ROD POSITION DEVIATION LOW-LOW LIMIT, and CB-4/A20, Window B-6, ROD DROP NUCLEAR INSTRUMENTATION CHANNEL
	ATCO	Enter ARP-CB-4/A8, Window A-5L.
	ATCO	Verify at least one CEA is at Lower Mechanical Stop with green rod position indicator light on. (ARP-CB-4/A8, Window A-5L, Step 1)
	TS-CRS	Possible momentary entry into TS 2.10.4(5)(a)(ii) for pressurizer pressure less than 2075 psia.
	CRS	Enter AOP-02, CEA AND CONTROL SYSTEM MALFUNCTIONS, Section III, "Misaligned Group 4 CEA" (ARP-CB-4/A8, Window A-5L, Step 2)
	CRS	Review cautions, prerequisites and notes of AOP-02.
	BOPO	Adjust turbine load to match reactor power (AOP-02, Section III, Step 3)
	ATCO	Establish steady reactor power (AOP-02, Section III, Step 4)
	ATCO	Ensure RCS pressure is 2075 to 2150 psia (AOP-02, Section III, Step 5)
	ATCO	Ensure PZR level is within 2% of program level (AOP-02, Section III, Step 6)
	ATCO	Reset rod drop detection circuit bistables on all RPS linear power channels' and power range control channels' drawers (AOP-02, Section III, Step 7)
	ATCO	Verify ROD DROP NUCLEAR INSTRUMENTATION CHANNEL alarm resets on CB-4, A20 (AOP-02, Section III, Step 8)
	CRS	Notify system operations of power reduction (AOP-02, Section III, Step 9)
	CRS	Notify reactor engineer of CEA misalignment (AOP-02, Section III, Step 10)
	CRS	If CEA misaligned greater than 18 inches, go to Step 20 (AOP-02, Step 11)
	ATCO	Lower reactor power to less than or equal to 70% ΔT power within 1 hour of misalignment using boration from the SIRWT per AOP-05, EMERGENCY SHUTDOWN (AOP-02, Section III, Step 20)
	CRS	Enters AOP-05
	ATCO	Ensure one charging pump is running (AOP-05, Step 1.a)
		Event description continued on next page

Op-Test No.: _____ Scenario No.: _2__ Event No.: __5, 6__	Page _9__ of __16_
Event Description: CEA 4-01 drop, requiring a rapid downpower using AOP-05.	

Time	Position	Applicant's Actions or Behavior
	ATCO	Open LCV-218-3, Charging Pump Suction SIRWT Isolation Valve (AOP-05, Step 1.b)
	ATCO	Close LCV-218-2, VCT Outlet Valve (AOP-05, Step 1.c)
	BOPO	Maintain RCS T_C by adjusting turbine load as necessary. (AOP-05 Step 3)
	ATCO/BOPO	Maintain both of the following primary plant parameters during the power reduction: T_C 527-545°F and PZR 45-60%. (AOP-05, Step 4)
	ATCO	Maximize pressurizer heaters and spray (AOP-05, Step 5)
	CRS	Direct shift chemist to sample the RCS to satisfy TS 3.2, Equipment and Sampling Tests (AOP-02, Section III, Step 21)
	CRS	Enter TS 2.10.2(4)(e) for a full length CEA misaligned greater than 18 inches. Must reduce power less than 70% within 1 hour, then within 1 hour after that, realign CEA or declare CEA inoperable.
		Once applicants have commenced the rapid down-power and reactor effects have been noted, the lead examiner cues the next malfunction at his/her discretion.

Op-Test No.: _____ Scenario No.: _2__ Event No.: _7, 8__		
Event Description: 100% severity RCP Seal Cooler Leak on CVC 16.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A1 Window A5U, CC WATER FROM RC-3A SEAL COOLER TEMP HI
	ATCO	Enter ARP-CB-1,2,3/A1 Window A5U.
	ATCO	If alarm is not due to operation of selector switches, then check TI-458/465, CCW temperature from RC-3A seal cooler greater than 120 degrees (Step 1)
	ATCO	If CCW temperature is high, then raise flow through RC-3A seal cooler with HCV-442, RC-3A pump seal cir AC outlet. (Step 2)
	ATCO	Monitor CCW flow from RC-3A seal cooler (Step 2.1)
	ATCO	Monitor RC-3A parameters on ERF display 440. (Step 2.2)
	ATCO	ARP-CB-1,2,3/A1 Window A5U CAUTION: RCP operation must be terminated if CCW flow is not re-established within 5 minutes OR high temperature alarms are received on RCP lube oil coolers, RCP seal bleed-off or CEDM seals.
	CRS	Direct entry into AOP-35 for RCP malfunctions.
	CRS	Enter Section I if lower seal temperature exceeds 200 degrees. Enter Section II if motor radial or thrust bearing temperatures exceed 203 degrees (actions are the same).
	CRS	Direct ATCO to manually trip the reactor and enter EOP-00, STANDARD POST TRIP ACTIONS
	ATCO	Trip the reactor (Step 1.1.a)
	ATCO BOPO	Perform SPTA's per EOP-00. (Step 1.1.b)
	ATCO	Stop RCP-3A. (AOP-35 Step 1.1.c)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _2__ Event No.: __7,8__		Page _11__ of _16_
Event Description: __100% severity RCP Seal Cooler Leak on CVC 16. Turbine fails to trip on reactor trip. The malfunction is preprogrammed and will occur when the ATCO manually trips the reactor.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify reactivity control is established by verifying reactor power lowering, startup rate is negative, no more than one regulating or shutdown CEA not inserted, and monitor for an uncontrolled RCS cooldown (EOP-00, Step 1) **Note: the crew may emergency borate because they think that they have an uncontrolled cooldown but it is really because of the crew's delay in tripping the turbine in the next step below this one.**
	BOPO	Verify turbine tripped as indicated by stop and intercept valves indicating closed. (EOP-00, Step 2)
	BOPO **(CT)**	Trip the turbine on CB-10,11. (Step 2.1.a) OR Stop EHC pumps by placing both EHC-3A and EHC-3B in pull-to-lock. **Critical task is to perform these actions before performing any other actions.**
	BOPO	Ensure generator output breaker 3451-4, generator output break 3451-5, and generator field breaker 41E/G1F are tripped (EOP-00, Step 3)
	BOPO	Verify buses 1A3 and 1A4 are energized (EOP-00, Step 4)
	BOPO	If SIAS has occurred, then ensure both diesel generators have started (EOP-00, Step 5)
	BOPO	Check that buses 1A1 and 1A2 are energized (EOP-00, Step 6)
	BOPO	Check that 125 VDC buses 1 and 2 are energized (EOP-00, Step 7)
	BOPO	Verify instrument air available: instrument air pressure greater than or equal to 90 psig and at least one air compressor operating (EOP-00, Step 8)
	ATCO	Determine normal CCW system operation: ensure at least one CCW pump operating, CCW pump discharge pressure greater than or equal to 60 psig, at least one RW pump operating, and if CCW pump discharge pressur greater than or equal to 50 psig, ensure RCP coolers CCW valves HCV-438A/B/C/D are open (EOP-00, Step 9)
	ATCO	Verify RCS inventory control: PZR level 30-70%, PZR level trending to 45-60%, and RCS subcooling greater than or equal to 20°F (EOP-00, Step 10). Transition to contingency action.
	ATCO	Restore inventory control, manually control charging and letdown to restore pressurizer level (EOP-00, Step 10.1.a)
		Event description continued on next page

Op-Test No.: _____ Scenario No.: _2__ Event No.: __7, 8__ Page _12__ of _16_
Event Description: 100% severity RCP Seal Cooler Leak on CVC 16 (cont'd)…

Time	Position	Applicant's Actions or Behavior
	ATCO	If HPSI stop and throttle criteria (RCS subcooling greater than or equal to 20°F, PZR level greater than or equal to 10% and not lowering, at least one steam generator available for heat removal, and RVLMS indicates level is at or above top of the hot leg), then throttle and stop any or all HPSI pumps (EOP-00, Step 10.1.b)
	ATCO	Verify RCS Pressure Control: RCS pressure 1800-2300 psia, trending to 2050-2150 psia, and PORVs are closed (EOP-00, Step 11). Transition to contingency.
	ATCO	If RCS pressure less than 1350 psia, trip one RCP in each loop (EOP-00, Step 11.2)
	ATCO	If RCS pressure less than or equal to 1600 psia, verify engineered safeguards actuated: emergency boration in progress, SI flow acceptable per Attachment 3, VIAS has actuated (86A/VIAS, 86B1/VIAS, 86B/VIAS, 86A1/VIAS are all tripped), and CIAS has actuated (86A/CIAS, 86B1/CIAS, 86B/CIAS, 86A1/CIAS) (EOP-00, Step 11.3)
	ATCO	If RCS pressure control not established, manually control PZR heaters and spray to restore pressure (EOP-00, Step 11.4)
	ATCO	Verify core heat removal via forced circulation by all of the following: (EOP-00, Step 12)
		RCP NPSH requirements are satisfied per Att. 2
		At least one RCP is operating
		Core ΔT is less than or equal to 10°F
		Note: Due to the seal cooler leak, eventually all 4 RCP's will require stopping and at that point, the ATCO should verify development of natural circulation.
	BOPO	Verify Main Feedwater is restoring level in at least one steam generator to 35-85% NR by performing the following: (EOP-00, Step 13)
	BOPO	Ensure both feed reg valves, FCV-1101 and FCV-1102, have ramped closed (EOP-00, Step 13.a)
	BOPO	Ensure both feed reg bypass valves, HCV-1105 and HCV-1106, have ramped to 40-45% (EOP-00, Step 13.b)
	BOPO	Place the "43/FW" switch in "OFF" (EOP-00, Step 13.c)
	BOPO	Ensure no more than one feed pump operating (EOP-00, Step 13.d)
	BOPO	Ensure no more than one condensate pump is operating (EOP-00, Step 13.e)
		Event description continues on next page

Event Description: 100% severity RCP Seal Cooler Leak on CVC 16 (cont'd)….

Time	Position	Applicant's Actions or Behavior
	BOPO	Stop all operating heater drain pumps, FW-5A/B/C (EOP-00, Step 13.f)
	BOPO	Ensure both sets of steam generator blowdown isolation valves, HCV-1387A/B and HCV-1388A/B, are closed (EOP-00, Step 13.g)
	BOPO	Verify steam dump and bypass valves are controlling both RCS T_C 525-535°F and S/G pressure 850-925 psia (EOP-00, Step 14)
		Note: The validation crew thought they had a problem with PCV-910 being stuck open when actually the big cooldown was caused by their delay in tripping the turbine approx 10 seconds.
	ATCO	Verify normal containment conditions: no unexpected rise in sump level, no containment area alarms, RM-051, 052, and 062 not in alarm, RM-054A/B and RM-057 not in alarm or trending upward, containment pressure less than 3.0 psig and containment temperature less than 120°F(EOP-00, Step 15)
	CRS	Determine appropriate procedure to implement per Section 6, Diagnostic Actions(EOP-00, Step 16)
	CRS	Direct entry into EOP-03, LOSS OF COOLANT ACCIDENT
	CRS	Confirm SPTAs performed (EOP-03, Step 1)
	CRS	Confirm diagnosis of LOCA by: verify safety function status check acceptance criteria satisfied and direct shift chemist to perform rapid activity analysis of both steam generators (EOP-03, Step 2) **Note: Eventually, all four reactor coolant pumps will have to be tripped due to temp issues. RC-3B should be the last one tripped due to its different design from the others.**
	CRS	Implement the emergency plan (EOP-03, Step 3)
	ATCO/BOPO	Monitor the floating steps (EOP-03, Step 4)
	ATCO	If RCS pressure is less than or equal to 1600 psia, verify engineered safeguards actuated: emergency boration in progress, SI flow acceptable per Attachment 3 (EOP-03, Step 6)
	ATCO	If SIAS has actuated, then maximize SI and charging flow to RCS by operating all of the following pumps: HPSI pumps, SI-2A/B or SI-2B/C, LPSI pumps, SI-1A/B, and charging pumps CH-1A/C (EOP-03, Step 8)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _2__ Event No.: __7,9__ Page _14__ of _16		
Event Description: 100% severity RCP Seal Cooler Leak on CVC 16. RCP seal cooler CCW isolation valve HCV-438C fails to close on demand.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify RCP operating parameters: if T_C less than 500°F, ensure at least one RCP stopped; if RCS pressure less than 1350 psia following SIAS actuation, ensure no more than 1 RCP running in each loop (EOP-03, Step 9)
	CRS	Record time of SIAS initiation (EOP-03, Step 10)
	ATCO	Verify normal CCW/RW system operation by performing the following: (EOP-03, Step 11). **Note the validation crew deviated from the procedure on this step.**
	ATCO	Ensure at least two CCW pumps operating (EOP-03, Step 11.a) **Note: Only 1 pump is operating.**
	ATCO	Verify CCW pump discharge pressure greater than or equal to 60 psig (EOP-03, Step 11.b)
	ATCO	Ensure at least two raw water pumps operating (EOP-03, Step 11.c) **Note: Only 1 pump is operating**
	ATCO	Ensure at least three CCW heat exchangers in service (EOP-03, Step 11.d) **Note: Only one HX is in service.**
	ATCO	Ensure all RCP Coolers CCW valves, HCV-438A/B/C/D are open (EOP-03, Step 11.e)
	ATCO	Verify PORVs and PZR code safety valves are closed by performing the following: (EOP-03, Step 12)
	ATCO	Check that all PZR quench tank alarms are clear (QUENCH TANK TEMP HI, QUENCH TANK PRESS HI, AND QUENCH TANK LEVEL HI-LO) (EOP-03, Step 12.a)
	ATCO	Check all relief header temperature alarms are clear (PRESSURIZER PWR OPERATED RELIEF VALVE DISCH TEMP HI, PRESSURIZER SAFETY VALVE RC-141 DISCH TEMP HI, PRESSURIZER SAFETY VALVE RC-142 DISCH TEMP HI) (EOP-03, Step 12.b)
	ATCO	Check both relief header acoustic flow alarms are clear (RC-142/PCV-102-1 VALVE FLOW and RC-141/PCV-102-2 VALVE FLOW) (EOP-03, Step 12.c)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _2__ Event No.: __7,9__ Page _15__ of _16_
Event Description: 100% severity RCP Seal Cooler Leak on CVC 16. RCP seal cooler CCW isolation valve HCV-438C fails to close on demand.

Time	Position	Applicant's Actions or Behavior
	ATCO	If an RCS to CCW leak is evident, then minimize RCS leakage by performing the following: (EOP-03, Step 13)
	ATCO	Trip all RCPs (EOP-03, Step 13.a)
	ATCO	Close all RCP coolers CCW valves, HCV-438A/B/C/D (EOP-03, Step 13.b) **Note: HCV-438C fails to close on demand from control room.**
	CRS	Transition to contingency action (EOP-03, Step 13.b.1)
	ATCO/BOPO **(CT)**	Lower RCS pressure less than 380 psia (EOP-03, Step 13.b.1). Critical task is to lower RCS pressure before attempting to locally manually close HCV-438C.
		Note: TS 2.1.4(3) applies for RCS leakage limits but is not counted in this scenario because it is part of the major event and per the NUREG may be over-shadowed by it.
		Lead examiner can end scenario after the cooldown/depressurization is in progress at his/her discretion.

Procedure Number	Procedure Title	Revision
OI-FW-1	CONDENSATE SYSTEM NORMAL OPERATION	60
ARP-CB-1,2,3/A2		38
OI-CH-1	CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL OPERATION	88
SO-O-23	SYSTEMS AND EQUIPMENT USAGE DATA	21
ARP-DCS-FW		3
ARP-CB-1,2,3/A4		30
ARP-CB-4/A8		24
AOP-02	CEA AND CONTROL SYSTEM MALFUNCTIONS	8
AOP-05	EMERGENCY SHUTDOWN	11
ARP-CB-1,2,3/A1		34
AOP-35	REACTOR COOLANT PUMP MALFUNCTIONS	5
EOP-00	STANDARD POST TRIP ACTIONS	29
EOP-03	LOSS OF COOLANT ACCIDENT	36

Scenario # 2 Malfunction List

Event #	Description	Type	System	Command	Severity	Ramp
1	Rotate Condensate Pumps	Normal				
2	CH-1B Trips	MALF	CVC	BUS_1B4C_6_BKR_TRIP	TRUE	
3	LT-903Y Fails	TRAN	FWC	SGN_LT903Y	40%	10 min
4	Pressure Transmitter fails high	TRANS	RRS	RCS_PT103X	100%	2 min
5	Dropped rod	MALF	CRD	ROD_PWR_401_1	DEENERGIZED	
6	AOP-05 Power Reduction	Normal				
7	RCP Seal Cooler Leak	MALF	RCP	CVC28	25%	
8	Turbine Fails to Trip (preset)	Preset		Engineering Mode Freeze Flags		
9	HCV-438C fails open (preset)	VLV	CCW	CCW_HCV438C	100%	

Facility: _Fort Calhoun Station__ Scenario No.: ___3____ Revision __1__ Op-Test No.: _______

Examiners: ______________________________ Operators: ______________________________

Initial Conditions: _Reactor is currently at approximately 90% power. I&C is currently troubleshooting the power range NI power supply. Technical Specification 2.15(1) was entered at 0428 today. Trip units 1, 2, 9, 10, and 12 are currently in BYPASS for channel A.

Turnover: ___The plant entered TS 2.0.1 due to a condition affecting both diesel generators. A plant shutdown was initiated. After power had been reduced to 90%, the condition was resolved and TS 2.0.1 was exited. You have been directed to maintain power at 90% until the Reactor Engineer prepares PAPeRS guidance for power ascension back to 100% power.____________________

Event No.	Malf. No.	Event Type*	Event Description
1		R-ATCO N-BOPO	Maintain power at 90%.
2		C-BOPO	Instrument Air Compressor CA-1C fails. Standby compressor CA-1B running but not loaded. Alarm is ARP-CB-10,11/A11 Window B-3L. No entry into AOP-17.
3		TS-CRS I-ATCO	Channel B power range NI summing amplifier fails low. T.S. 2.15(1) was already entered due to bypassed trip units 1, 2, 9, 10, 12 and these must be placed in trip per **T.S. 2.15(2).** Also, per T.S. Table 2-2 note C, power must be reduced to less than 70%. AOP-15.
4		C-BOPO	Heater Drain Pump FW-5B trips, standby fails to autostart. Alarm is ARP-CB-10,11/A12 Window A-4L. Actions are required to start the standby pump.
5		TS-CRS	RCS oxygen levels are greater than 0.20 ppm, causing entry into **T.S. 2.1.5(1).**
6		C-ATCO	Raw water pump AC-10D trips, standby fails to autostart. Alarm is ARP-CB-1,2,3/A1 Window D1U. Also, alarms CB-1,2,3/A1 C1U and C1L will come in shortly after pump trip.
7		C-BOPO	Loss of MCC 3C2 due to a ground fault. This causes a loss of boric acid pump CH-4A, boric acid gravity feed line valve HCV-265, and boric acid pumps discharge valve HCV-268. Alarm: CB-4/A7 “Boric Acid Valves Trouble.” AOP-32
8		M-ALL **(CT)**	ATWS – RPS pressurizer pressure channel D/PIA-102Y fails low, causing 2 out of 3 for TM/LP but no RPS trip. Critical task is for ATCO to manually trip the reactor before performing any other actions.

9		C-ATCO **(CT)**	Following manual trip, 5 control rods fail to insert. This will require emergency boration. However, HCV-258 is mechanically bound when the operators attempt to open it. This results in the inability to emergency borate using the BASTs and requires use of the SIRWT to emergency borate. EOP-20. Critical task is to open LCV-218-3, Charging pump suction SIRWT isol. Valve, close LCV-218-2, VCT Outlet valve, and starting all charging pumps prior to exiting that safety function success path.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

SCENARIO SUMMARY NRC #3

The crew assumes the watch with the reactor at 90% power. Trip units 1, 2, 9, 10, and 12 for channel A are in BYPASS due to troubleshooting efforts. The crew instructions are to maintain power at 90%.

The first event is a trip of instrument air compressor CA-1C. The standby is running but unloaded. Operator actions are per ARP-CB-10,11/A7 and include starting the CS air compressor.

The next event is a failure of the B channel power range NI summing amplifier. Operator action is to place the channel in the tripped position within one hour and downpower to less than 70% per T.S. 2.15(2) and Table 2-2 Note C. SRO will refer to Technical Specifications. **T.S. 2.15(2)** applies as does Note C of Table 2-2.

The next event is a trip of heater drain pump FW-5B. Backup heater drain pump will not start automatically. Operator will need to start the backup pump.

The next event is a high oxygen concentration in the RCS of 0.20 ppm, which is called in by chemistry. No operator action. SRO will refer to Technical Specifications. **T.S. 2.1.5(1)** applies.

The next event is a trip of raw water pump AC-10D. Backup raw water pump will not start automatically. Operator will need to start backup pump.

The next event is a loss of MCC 3C2 due to a ground fault. Operator action is per ARP-CB-4/A7 and AOP-32, LOSS OF 4160 VOLT OR 480 VOLT BUS POWER and includes operating the primary water booster pump and steam generator blowdown transfer pump as necessary. SRO will refer to Technical Specifications (T.S. 2.7.2(g) for loss of MCC-3C2 is under review by NRR TS branch and was not included as part of the exam grading criteria).

The D channel for RPS pressurizer pressure then fails low, resulting in a 2 out of 3 trip logic for TM/LP, but no reactor trip has occurred. The crew is expected to recognize that an RPS actuation was required, and take action to manually trip the reactor (**critical task**).

When the operator manually trips the reactor, five CEA's fail to insert requiring emergency boration, which is unsuccessful due to HCV-258 failure to open. Following completion of standard post trip actions, SRO directs entry into EOP-20, FUNCTIONAL RECOVERY, Success Path RC-2. The crew will initiate boration using the SIRWT (**critical task**).

Once the crew has initiated boration using the SIRWT, the scenario can be terminated.

Op-Test No.: _____ Scenario No.: __3__ Event No.: __1__	Page _4_ of _18__

Event Description: ____Maintain power at 90% using OP-4, Attachment 2, Step 5 and Attachment 3, Step 1.

Time	Position	Applicant's Actions or Behavior
	CRS	Reviews OP-4, LOAD CHANGE AND NORMAL POWER OPERATION, Attachment 2, "Power Reduction" and Attachment 3, "Steady State"
	BOPO	Lower Turbine Generator Load to maintain RCS Tave program per TDB Figure III.1. (OP-4, Att. 2, Step 5.a). CRS should give BOPO a band to maintain Tcold, 532°F +0°F -1°F. This will maintain Tave on program.
	ATCO	For fuel burnup or xenon changes, borate or dilute as necessary per OI-CH-4 to maintain the following (OP-4, Att. 3, Step 1): • Desired reactor power • Desired regulating CEA group position • RCS Tave Program per TDB Figure III.1 In this case, the ATCO will be diluting per OI-CH-4, CHEMICAL AND VOLUME CONTROL SYSTEM MAKEUP OPERATIONS, Attachment 12, "Normal Dilution of the RCS to Control Reactor Power".
	ATCO	Verify a deaerated water booster pump, DW-43A or DW-43B, is in operation, or if cross-connected to demin water, a demineralized water booster pump, DW-41A or DW-41B, is in operation. (OI-CH-4, Att. 12, Prereq. 2)
	ATCO	Verify waste disposal system is available to receive letdown flow diverted from the VCT. (OI-CH-4, Att. 12, Prereq. 3)
	ATCO	Determine required gallons of demineralized water by using FC-1250A, Power/Inventory Maintenance Log. (OI-CH-4, Att. 12, Step 1) ATCO should determine approximately 300 gallons of water should be added.
	ATCO	Record number of gallons of makeup water to be added to the RCS. (OI-CH-4, Att. 12, Step 2)
	ATCO	Ensure HC-269, Makeup Water Mode Selector Switch, is in DILUTE. (OI-CH-4, Att. 12, Step 3). Note: Switch should already be in DILUTE.
	ATCO	Ensure FCV-269, Makeup Water Control Valve, is in CLOSE. (OI-CH-4, Att. 12, Step 4). Note: Valve should already be in CLOSE.
	ATCO	Review note. Dilution of the RCS may be performed in intermittent batches of makeup water to verify proper response.
		Event description continues on next page

Op-Test No.: _____ Scenario No.: __3__ Event No.: __1__

Event Description: ____ Maintain power at 90% using OP-4, Attachment 2, Step 5 and Attachment 3, Step 1._______

Time	Position	Applicant's Actions or Behavior
	ATCO	Set FQS-269X, Demin Water Makeup Flow Batching Switch, to the desired number of gallons of water to be added. (OI-CH-4, Att. 12, Step 5) Note: ATCO may add any amount of water provided it is less than the calculated and recorded value in Step 2. They may choose to add the water in batches, as allowed by the note.
	ATCO	Record the initial Demin Water Makeup Flow Totalizer reading, FQI-269X. (OI-CH-4, Att. 12, Step 6)
	ATCO	Review notes: 1. Makeup water flow may be stopped at any time by closing FCV-269, 2. Steps 7 through 12 may be signed off after these steps are complete.
	ATCO	Open FCV-269, Makeup Water Control Valve. (OI-CH-4, Att. 12, Step 7)
	ATCO	Review Caution: All available indications shall be monitored for desired effects during any reactivity change.
	ATCO	Place FCV-269X, Demin Water Makeup Flow Control Valve, in AUTO. (OI-CH-4, Att. 12, Step 8)
	ATCO	With FC-269X, Demin Water Makeup Flow Controller, set Demin Water flow to the desired flow rate. (OI-CH-4, Att. 12, Step 9). Note: Expected desired flow rate to be between 80 – 90 gallons per minute.
	ATCO	If unexpected reactivity effects are observed, then stop the makeup flow and evaluate. (OI-CH-4, Att. 12, Step 10).
	ATCO	When dilution is complete, then place FCV-269X, Demin Water Makeup Flow Control Valve, in CLOSE. (OI-CH-4, Att. 12, Step 11)
	ATCO	Close FCV-269, Makeup Water Control Valve. (OI-CH-4, Att. 12, Step 12)
	ATCO	Verify VCT level and pressure respond as expected. (OI-CH-4, Att. 12, Step 13)
	ATCO	Record final Demin Water Makeup Flow Totalizer reading, FQI-269X. (OI-CH-4, Att. 12, Step 14)
	ATCO	Verify the amount of Demin Water added from the flow totalizer is consistent with the amount of water added. (OI-CH-4, Att. 12, Step 15)
		Event is terminated once reactor reactivity effects are seen. Lead examiner cue next event.

Op-Test No.: _____ Scenario No.: __3__ Event No.: __2__ Page _6__ of _18

Event Description: ____Instrument air compressor CA-1C fails. Standby compressor CA-1B is running but unloaded. Event is initiated at lead examiner's cue.

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm CB-10,11/A11 Window B-3L, AIR COMPRESSORS BKR TRIP
	BOPO	Enter ARP-CB-10,11/A11, Window B-3L.
	BOPO	Dispatch an operator to the air compressors. (Step 1.1)
	BOPO	Ensure AC-9A or 9B, TPCW pump, is running. (Step 1.2)
	BOPO	Start the CS air compressor, CA-1A. (Step 1.3)
	BOPO	Check 1B3C power supply for undervoltage, and dispatch an operator to check the air compressor breaker for overcurrent trip. (Step 2.1)
	CRS	If breaker tripped, notify electrical maintenance.
	BOPO	Check running air compressor for proper operation. (Step 3)
		Note: the crew may decide to put air compressor CA-1C in pull-to-lock.
		Event is terminated once the CS air compressor is started and verified to be operating. Lead examiner will cue next event.

Op-Test No.: _____ Scenario No.: __3__ Event No.: __3__		Page _7__ of _18__
Event Description: ____ Channel B power range NI summing amplifier fails low. ____________		
Time	**Position**	**Applicant's Actions or Behavior**
	ATCO	Respond to alarm CB-4/A20 Window B-6, ROD DROP NUCLEAR INSTRUMENTATION CHANNEL, Window D-5, LOSS OF LOAD CHANNEL TRIP BYPASSED, and Window E-6, NUCLEAR ΔT POWER CHANNEL DEVIATION
	ATCO	Enter ARP-CB-4/A20 Window B-6.
	ATCO	If more than one rod dropped, then trip the reactor and go to EOP-00. (Step 1). No rod dropped, so this step is N/A.
	ATCO	Check for indication of Dropped Rod (Step 2): • Core mimic for green rod bottom light • Decrease in reactor power • Decrease in reactor coolant loop Tavg • DROPPED ROD (CB-4, A8, A-5L) • 4" and 8" Rod Deviation Annunciators (CB-4, A8, B-1U and B1L) • SCEAPIS indicates rod deviation • SCEAPIS indicates dropped rod • PPDIL and PDIL alarms • Rod drop light on RPS Note: No dropped rod.
	ATCO	Reset the six rod drop detection circuit bistables on the four RPS Linear Power Channel and two Power Range Control Channel drawers. (Step 2.1)
	ATCO	If a dropped rod is indicated, go to AOP-02. (Step 2.2) No dropped rod.
	ATCO	If there is no indication of a dropped rod, check the following (Step 3): 1. Check all nuclear instrumentation channels high voltage energized. 2. Verify both NI Subchannel Trip Test Switches in OFF. 3. Verify the NI Subchannel Calibrate Switch in the Operate position.
	ATCO	If NI channel high voltage is lost, then notify I&C of malfunction. (Step 4) Step is N/A.
	ATCO	If switch is found out of position and testing is not in progress, then return the affected switch to the proper position. (Step 5). Step is N/A.
	ATCO	If an NI channel is declared inoperable, then bypass the affected channel per T.S. 2.15 and make notifications per SO-O-28. (Step 6) ATCO should realize that the affected trip units on channel A are already in bypass, and this step cannot be performed.
	CRS	Determine that entry conditions for AOP-15 are met and direct entry into AOP-15, LOSS OF FLUX INDICATION OR FLOW STREAMING, Section I, Loss of Power Range Safety Channels.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: __3__ Event No.: __3__			Page _8__ of _18__
Event Description: ____ Channel B power range NI summing amplifier fails low. ____________			

Time	Position	Applicant's Actions or Behavior
	CRS	If one power range safety channel has failed or operates erratically, then disable the affected RPS Trip Units within one hour. (AOP-15, Section I, Step 1). Two power range safety channels are inoperable, therefore, transition to contingency.
	CRS	If more than one power range safety channel fails, go to Step 6. (Step 1.1)
	CRS	Review Note: If two power range safety channels remain failed for 48 hours, then the plant must be placed in hot shutdown within the following 12 hours.
	ATCO	If two power range safety channels fail or operate erratically, then disable the affected RPS trip units within one hour of failure of the second channel by performing the following: (Step 6)
	CRS	Place all of the following RPS trip units on one of the inoperable channels in bypass within one hour: TU-1, TU-2, TU-9, TU-10, TU-12. (Step 6.a) Note: This has already been done as part of the initial conditions.
	ATCO	Place affected RPS trip units on the other inoperable channel in trip within one hour by performing the following: (Step 6.b) This should be performed on Channel B.
	ATCO	Place the Power Range Monitor drawer "TEST ENABLE" switch in "ENABLE" on the inoperable channel. (Step 6.b.1) Channel B
	ATCO	Place the Power Range Monitor drawer "TEST SELECT" switch in "CAL MID" on the inoperable channel. (Step 6.b.2) Channel B
	ATCO	Verify the red trip indicator light is lit on TU-1, TU-9 and TU-12. (Step 6.b.3) Channel B
	CRS	Remove all the following trip units from the inoperable channel (Step 6.b.4). CRS will direct I&C to remove these units.
	CRS	With two power range safety channels inoperable, reduce reactor power to less than or equal to 70% per OP-4, LOAD CHANGE AND NORMAL POWER OPERATION. (Step 7)
	CRS	Enter **T.S. 2.15(2)** for two inoperable channels for TU-1, TU-2, TU-9, TU-10, and TU-12. This requires placing one channel for these trip units in trip. Also, Note C on Table 2-2 requires that power be reduced to less than 70%.
		Event is terminated once T.S. call is made. Lead examiner will cue the next event.

Event Description: ____Heater drain pump FW-5B trips, standby pump fails to autostart

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm CB-10,11/A12, Window A-4L, HEATER DRAIN PUMP B OVERLOAD/TRIP
	ATCO or BOPO	Enter ARP-CB-10,11/A12 Window A-4L.
	BOPO	If no heater drain pumps are operating, then consider starting an additional condensate pump. (Step 1). BOPO determines one heater drain pump is operating.
	BOPO	Dispatch an operator to check the status of FW-5B, heater drain pump. (Step 2)
	BOPO	If FW-5B is tripped, then ensure that standby heater drain pump FW-5A or C has automatically started. (Step 3) Note: standby pump failed to autostart.
	BOPO	If two pumps are required, then start standby heater drain pump FW-5A. (Step 3.1) Note: Two heater drain pumps are required.
	BOPO	Check the following for the cause of the FW-5B trip: • Heater Drain Tank low level • 49/FW-5B, Overcurrent Relay, tripped at 1A2 (1A2-9) • Motor stopped from the local stop pushbutton • Motor stopped from the 69 permissive switch (1A2-9) • Low voltage on 4160V Bus 1A2 (Step 3.2)
	CRS	Notify Electrical Maintenance of pump trip. (Step 3.3)
		Note: Crew may decide to place the tripped pump in pull-to-lock.
		Event is terminated once the standby pump has been started. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: __3__ Event No.: _5__ Page _10__ of _18__

Event Description: ____High oxygen concentration (0.20 ppm) in the RCS. Report is called in by chemistry at the lead examiner's cue.

Time	Position	Applicant's Actions or Behavior
	CRS	Take report from chemistry about 0.20 ppm dissolved oxygen in RCS. This is in Action Level 2 per CH-AD-0003.
	CRS	Direct entry into AOP-41, Section II RCS Chemistry
	CRS	Direct shift manager to notify Operations Manager, Reactor Engineer, Supervisor-Reactor Performance Analysis, and Manager-Chemistry (Section II, Step 5.a)
	CRS	Refer to Technical Specification 2.1.5(1). **T.S. 2.1.5(1)** states that if the oxygen concentration exceeds 0.1 ppm during power operation, initiate corrective action within 8 hours to return oxygen levels to <0.1 ppm. If not restored within 24 hours, place in hot shutdown within 12 hours after that. If not restored within an additional 24 hour period, put in cold shutdown 24 hours after that (2.1.5(5)). (Step 5.b)
	CRS	Restore chemistry to below action level 2 within 24 hours.
		Event is terminated once technical specification call is made.

Op-Test No.: _____ Scenario No.: __3__ Event No.: _6__		Page _11__ of __18_
Event Description: __________ Raw water pump AC-10D trips, standby fails to autostart._______		

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarms CB-1,2,3/A1 Window D1U, RAW WATER PUMPS BREAKER OVERLOAD OR TRIP, Window C1U, RAW WATER SUPPLY HEADER FLOW LO, and Window C1L, RAW WATER SUPPLY HEADER PRESS LO. Note: Alarm D1U comes in first, and the other two come in a few moments later.
	ATCO	Enter ARP-CB-1,2,3/A1 Window D1U.
	ATCO	Ensure a raw water pump is running and supplying raw water system. (Step 1) ATCO take action to start raw water pump determined by CRS (AC-10A).
	ATCO	Verify RW system flow by the following indications: • FIC-2890, East Header • FIC-2891, West Header (Step 2)
	ATCO	If both RW header flows are low (less than 1000 gpm), then go to AOP-18. (Step 2.1) Note: Since a raw water pump was able to be started, flows should recover and alarms C1U and C1L should clear. AOP-18 should not be entered.
	ATCO	Verify the white light for the tripped pump is on. (Step 3)
	CRS	Notify Electrical Maintenance to determine the cause of the pump trip. (Step 4)
		Event is terminated once a raw water pump has been started. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: __3__ Event No.: _7__ Page _12__ of __18_

Event Description: ____Loss of MCC 3C2 due to a ground fault. This event is initiated at lead examiner's cue.____

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-4/A7 Window B5U, BORIC ACID VALVES TROUBLE and Window B1U, BORIC ACID PUMP CH-4A OVERLOAD Note: backpanel alarm is AI-44/A39, A3, 480V Motor Overload Trip
	ATCO	Enter ARP-CB-4/A7 Window B5U
	ATCO	Check indicating lights for valves HCV-258, HCV-265, and HCV-268. (Step 1). Determine that valves HCV-265 and HCV-268 lights are off.
	ATCO	Dispatch equipment operator to check affected valve breakers. (Step 2) Determine that MCC-3C2 is deenergized.
	CRS	Direct entry into AOP-32, LOSS OF 4160 VOLT OR 480 VOLT BUS POWER, for loss of 480V bus MCC-3C2.
	CRS	Enter AOP-32 Section I, Plant Stabilization and Diagnostics
	BOPO	Ensure 43-1/D1 and 43-1/D2 DG mode selector switches are in EMERGENCY STANDBY. (Step 2)
	CRS	Go to Step 9 because plant is not on shutdown cooling. (Step 3)
	BOPO	Verify at least one vital 4160 V bus is energized. (Step 9)
	ATCO	Verify at least one CCW pump is running with discharge pressure greater than 60 psig (Step 10)
	ATCO	Ensure at least one raw water pump running. (Step 11)
	BOPO	Ensure one bearing water pump is running (Step 12)
	BOPO	Verify IA operation by ensuring any air compressor is running and instrument air pressure is greater than 90 psig. (Step 13)
	ATCO	Ensure any or all charging pumps are running (Step 14)
	ATCO	Maintain RCS pressure per pressure-temperature limits. (Step 15)
	ATCO	Terminate all radiaoactive releases. (Step 16)
	ATCO	Verify at least one RCP is operating (Step 18)
	BOPO	Maintain S/G levels 35-85% NR. (Step 19)
	ATCO	If condenser vacuum greater than 19 inches, verify RCS temperature being controlled by normal turbine generator operation. (Step 20)
	CRS	N/A step 21 because lighting is not lost.
	CRS	Determine that MCC-3C2 has been lost and transition to Section XXVII (Step 22)
		Event description continues on next page.

Op-Test No.: _____	Scenario No.: __3__	Event No.: _7__	Page _13__ of __18_

Event Description: ____Loss of MCC 3C2 due to a ground fault. This event is initiated at lead examiner's cue.____

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify alarm CB-4/A7 BORIC ACID VALVES TROUBLE in alarm, Boric Acid pump CH-4A status lights out, and VA-40A and VA-40C, Aux. Bldg. exhaust fan status lights out. (Step 1)
	CRS	Direct chemistry to obtain dew point readings as necessary to maintain radiation monitor operability. (Step 2)
	BOPO	Operate DW-41B, demineralized water booster pump as necessary (Step 3)
	CRS	Ensure all radioactive gaseous releases are terminated. (Step 4)
	BOPO	Operate FW-34B, steam generator blowdown transfer pump B, as necessary. (Step 5)
	ATCO/BOPO	Refer to Att. B for a complete list of components powered from MCC-3C2. (Step 6)
	CRS	Determine the cause of the loss of power to MCC-3C2. (Step 7)
	CRS	Enter **T.S. 2.7.2(g)** for loss of MCC-3C2 8-hour shut-down action statement. (Step 8) Either group of MCC's (3A1, 3A2, 3B1, 3C1, 3C2) or (4A1, 4A2, 4B1, 4C1, 4C2) may be inoperable for up to 8 hours, then placed in a hot shutdown within the following 12 hours, and cold shutdown 24 hours after that.
	CRS	Refer to ODCM. (Step 8)
		Event may be terminated once technical specification call is made.

Op-Test No.: _____ Scenario No.: __3__ Event No.: _8__

Event Description: ____ATWS. Channel D for RPS pressurizer pressure fails low. This results in a 2 of 3 logic, requiring a reactor trip. RPS fails, and no automatic RPS actuation occurs. This event is initiated at lead examiner's cue.__________

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A4 Window D-5, PRESSURIZER SAFETY INJ SIGNAL LO-LO PRESSURE D/P102Y
	ATCO/CRS	Determine that TM/LP meets the 2 out of 3 logic criteria, requiring a reactor trip which has not occurred.
	CRS	Direct ATCO to manually trip the reactor and enter EOP-00, SPTA's.
	ATCO **(CT)**	**Manually trip the reactor. Critical task is to manually trip the reactor before entry into ARP-CB-1,2,3/A4.**

Op-Test No.: _____ Scenario No.: __3__ Event No.: _9__ Page _15__ of _18__

Event Description: ____5 control rods fail to insert, requiring emergency boration. When ATCO attempts to emergency borate, HCV-258 mechanically bounds and cannot be opened. These events are preprogrammed into the scenario and will occur automatically once the reactor is manually tripped.____

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify reactor power is lowering, startup rate is negative and no more than one regulating or shutdown CEA not inserted. (Step 1). Transition to contingency action.
	ATCO	Manually trip reactor at CB-4 and/or AI-31, place DSS manual trip switches to TRIP, manually open the CEDM clutch power supply breakers at AI-57. (Step 1.1)
	ATCO	If more than one CEA not fully inserted, emergency borate by ensuring both FCV-269X and FCV-269Y are closed and attempt to open HCV-258, which fails to open. (Step 1.2a&b). **Note: may direct a local operator to attempt to open boric acid gravity feed valves HCV-265 and HCV-258. If so, these actions will not be completed successfully prior to procedural direction to borate using the SIRWT.**
	ATCO	Notify CRS of failure of emergency boration. **Note: A possible parallel path will be to emergency borate using the SIRWT using guidance from AOP-03. This operates the same valves as for the EOP-20 guidance.**
	BOPO	Verify turbine is tripped as indicated by stop and intercept valves indicating closed. (Step 2)
	BOPO	Ensure generator output breakers 3451-4 and 3451-5 and generator field breaker 41E/G1F are tripped. (Step 3)
	BOPO	Verify buses 1A3 and 1A4 are energized. (Step 4)
	BOPO	Check buses 1A1 and 1A2 are energized. (Step 6)
	BOPO	Check that 125 VDC buses 1 and 2 are energized. (Step 7)
	BOPO	Verify instrument air is available by both the following conditions: IA pressure greater than or equal to 90 psig and at least one air compressor is operating. (Step 8)
	ATCO	Ensure at least one CCW pump is operating with discharge pressure greater than or equal to 60 psig and at least one raw water pump is operating. Ensure RCP Coolers CCW valves HCV-438A/B/C/D are open(Step 9)
	ATCO	Verify RCS inventory control: pressurizer level 30-70%, trending to 45-60%, and RCS subcooling is greater than or equal to 20 degrees F. (Step 10)
	ATCO	Verify RCS pressure control: RCS pressure is 1800-2300 psia, trending to 2050-2150 psia and PORVs are closed. (Step 11)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: __3__ Event No.: _9__ Page _16__ of _18__		
Event Description: ____5 control rods fail to insert, requiring emergency boration. When ATCO attempts to emergency borate, HCV-258 mechanically bounds and cannot be opened. These events are preprogrammed into the scenario and will occur automatically once the reactor is manually tripped._		

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify core heat removal via forced circulation: RCP NPSH requirements satisfied, at least one RCP is operating, and core ΔT is less than or equal to 10 degrees F. (Step 12)
	BOPO	Verify main feedwater is restoring level in at least one S/G to 35-85% NR (73-94% WR) by performing the following (Step 13): • Ensure FCV-1101 and FCV-1102 feed reg valves have ramped closed. • Ensure both feed reg bypass valves have ramped to 40-45% • Place "43/FW" switch in OFF • Ensure no more than one feed pump operating • Ensure no more than one condensate pump operating • Stop all operating heater drain pumps • Ensure both sets of S/G blowdown isolation valves are closed (HCV-1387A/B and HCV-1388A/B)
	BOPO	Verify steam dump and bypass valves are controlling RCS Tcold 525-535 degrees F and S/G pressure 850-925 psia. (Step 14)
	ATCO	Verify normal containment conditions: no unexpected rise in the containment sump level, no containment area radiation alarms, no alarms on RM-051, RM-052, and RM-062, and no S/G blowdown or condenser off-gas radiation monitors are in alarm or trending upward. (RM-054A, RM-054B, and RM-057). (Step 15a-e)
	ATCO	Verify containment pressure less than 3.0 psig and temperature less than 120 degrees F. (Step 15.f)
	CRS	Determine appropriate procedure per Section 6.0, Diagnostic Actions. (Step 16). CRS should determine that EOP-20, Functional Recovery, must be entered due to the 5 CEA's that failed to insert and failure of emergency boration.
	CRS	Determine need to and enter RC-2 success path.
	BOPO	Maintain RCS temperature constant by controlled steaming using steam dump and bypass valves. (RC-2, Step 1)
	ATCO	Verify BAST is available for boration. (Step 2) Transition to contingency action.
	CRS	If both BASTs are unavailable, go to Step 4. (Step 2.1)
	ATCO **(CT)**	**Commence boration using the SIRWT (Step 4)**
	ATCO	**Open LCV-218-3, charging pump suction SIRWT isolation valve (Step 4.a)**
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: __3__ Event No.: _9__ Page _17__ of _18__		
Event Description: ____5 control rods fail to insert, requiring emergency boration. When ATCO attempts to emergency borate, HCV-258 mechanically bounds and cannot be opened. These events are preprogrammed into the scenario and will occur automatically once the reactor is manually tripped._		

Time	Position	Applicant's Actions or Behavior
	ATCO	**Stop both boric acid pumps (Step 4.b)**
	ATCO	**Ensure HCV-268, HCV-265, HCV-258, and LCV-218-2 (VCT outlet valve) are closed (Step 4.c)**
	ATCO	**Ensure charging isolation valves HCV-247, HCV-238, HCV-248, and HCV-239 are open. (Step 4.d)**
	ATCO	**Start all charging pumps (Step 4.e)**
	ATCO	Insert CEAs into the core using MANUAL SEQUENTIAL or MANUAL GROUP
		Scenario can be terminated once emergency boration has been started.

Procedure Number	Procedure Title	Revision
OP-4	LOAD CHANGE AND NORMAL POWER OPERATION	48
OI-CH-4	CHEMICAL AND VOLUME CONTROL SYSTEM MAKEUP OPERATIONS	45
ARP-CB-10,11/A11		23
ARP-CB-4/A20		44
AOP-15	LOSS OF FLUX INDICATION OR FLOW STREAMING	12
ARP-CB-10,11/A12		12
CH-AD-0003	PLANT SYSTEMS CHEMICAL LIMITS AND CORRECTIVE ACTIONS	84
AOP-41	CHEMISTRY OUT OF SPECIFICATION	0
ARP-CB-1,2,3/A1		34
ARP-CB-4/A7		17
AOP-32	LOSS OF 4160 VOLT OR 480 VOLT BUS POWER	17
EOP-00	STANDARD POST TRIP ACTIONS	29
EOP-20	FUNCTIONAL RECOVERY PROCEDURE	25

Scenario # 3 Malfunction List

Event #	Description	Type	System	Command	Severity	Ramp
IC	Power Range Channel A HV Power supply failure	MAL	NIS	NIS09 Bypass trip units 1,2,9,10,12	TRUE	
1	Maintain Power at 90%					
2	Air compressor Fails "C"	MALF	CAS	BUS_1B3A_4A_2_BKR_TRIP "C" AC	TRUE	
3	Power Range B summing amp fails	MAL	NIS	NIS30	0%	
4	FW-5B Trips	MALF	CON	BUS_1A2_9_BKR_TRIP	TRUE	
5	RCS O_2 high	Report O_2 at 0.20 ppm				
6	AC-10D Trips	MALF	RWS	BUS_1A4_12_BKR_TRIP	TRUE	
7	MCC 3C2 fault	REM	EDA	REM:BUS_1B3C_2	OPEN	
8	ATWS	TRAN	RRS	RCS_PT102D	1500	
	ATWS (preset)	MALF	RPS	RPS01	E	
	ATWS (preset)	MALF	RPS	RPS02	E	
	ATWS (preset)	MALF	RPS	RPS03	E	
	ATWS (preset)	MALF	RPS	RPS04	E	
9	CEA Stuck (preset)	MALF	CRD	ROD_PWR_A30_2	TRUE	
	CEA Stuck (preset)	MALF	CRD	ROD_PWR_A33_2	TRUE	
	CEA Stuck (preset)	MALF	CRD	ROD_PWR_B15_2	TRUE	
	CEA Stuck (preset)	MALF	CRD	ROD_PWR_B16_2	TRUE	
	CEA Stuck (preset)	MALF	CRD	ROD_PWR_112_2	TRUE	
10	HCV-258 stuck closed (preset)	VLV	CVC	HCV-258	0%	

Facility: _Fort Calhoun Station__ Scenario No.: ____4___ Revision __1__ Op-Test No.: _______

Examiners: ______________________________ Operators: ______________________________

Initial Conditions: __Mode 2 <1% power. Next step in OP-2A is to start 1 MFW pump. Desired MFW pump is FW-4B.___________

Turnover: _____Continue in OP-2A to raise power and load turbine. All requirements to transition to Mode 1 in OP-4 have been met.____

Event No.	Malf. No.	Event Type*	Event Description
1		N-BOPO	Start MFW pump FW-4B per OP-2A, Attachment 3. Attachment 2 contains local operator actions and the instructions for starting the lube oil pump.
2		R-ATCO	Raise reactor power to 10% per OP-2A.
3		C-ATCO TS-CRS	Wide range log NI-002 fails high. This failure should occur when the ATC has raised power sufficient to see reactor response and when directed by lead examiner. ARP-CB-4/A20, Windows B-7 and C-1. This will send the operators to AOP-15, where they are directed to secure from raising power and stabilize reactor. **T.S. 2.15(1)** applies for failure of NI.
4		C-BOPO	MFW pump FW-4B trips, no auto start of standby pump. Alarm is ARP-CB-10,11/A12.
5		C-ATCO	Controlling pressurizer level instrument 101X fails low. Alarm is ARP-CB-1,k2,3/A4 Windows A-8 and C-8
6		C-ATCO TS-CRS	CCW pump AC-3A trips, no autostart of standby pump. Alarm is ARP-CB-1,2,3/A2 Window D-3U. **T.S. 2.4(1)b** applies.
7		C-BOPO TS-CRS **(CT)**	Inadvertent AFAS. AOP-28 for inadvertent AFAS. **T.S.2.5.(1)D** and **TS 2.15(3)** apply. Critical task is to recognize the AFAS is inadvertent and take action to mitigate (stop feeding the steam generators with AFW)
8		M-ALL	Steam line break inside containment on RC-2A. EOP-00 to EOP-05.
9		C-BOPO **(CT)**	SGIS fails. Critical task will be for BOPO to isolate steam generator before exiting procedure step.
10		C-ATCO **(CT)**	Containment spray pump 3B fails to autostart but can be started from control panel. Containment spray pump 3A shaft shears. Critical task is to restore containment spray flow by either starting containment spray pump 3C or 3B.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SCENARIO SUMMARY NRC #4

The crew assumes the watch with the reactor is Mode 2 at less than 1% reactor power. The crew instructions are to start main feedwater pump FW-4B and continue with power ascension.

The first event is to start a main feedwater pump per OP-2A, PLANT STARTUP, Attachment 3.

The next event is to raise reactor power to 10% per OP-2A. Once a reactivity effect is seen on the reactor, the next event will be cued.

The next event is a failure of wide range logarithmic NI-002 high. Operator action is per CB-4/A20 and AOP-15, and includes securing from the power ascension and stabilizing the reactor. SRO will refer to Technical Specifications. **T.S. 2.15(1)** applies.

The next event is a trip of main feedwater pump FW-4B with no autostart of the standby pump. Operator actions are per ARP-CB-10,11/A12 and include starting the standby pump, setting the post SIAS feedwater pump to FW-4C, and selecting a new standby pump.

The next event is a failure of controlling pressurizer level instrument 101X low. Operator actions are per ARP-CB-1,2,3/A4 and include placing the pressurizer level control switch to channel Y and placing the pressurizer heater cutout channel select switch to channel Y.

The next event is a trip of CCW pump AC-3A with no autostart of the standby pump. Operator actions are per ARP-CB-1,2,3/A2 and include starting the standby CCW pump. SRO will review Technical Specifications. **T.S. 2.4(1)b** applies.

The next event is an inadvertent auxiliary feedwater actuation signal. Operator actions are per AOP-28, AUXILIARY FEEDWATER SYSTEM MALFUNCTIONS and include actions to stop the aux feed and bypass the affected AFAS signal (**critical task**). SRO will refer to Technical Specifications. **T.S.'s 2.5(1)D and 2.15(3)** apply.

After this event a steam line break occurs inside containment on RC-2A. The crew will enter EOP-00 and perform standard post trip actions. Automatic SGIS fails and the crew should recognize this and take action to manually isolate the steam generators (**critical task**).

Once the containment spray is actuated, containment spray pump 3A shaft shears and pump 3B fails to automatically start. The crew should recognize that they do not have any containment spray and take actions to start containment spray pump 3B, or containment spray pump 3C (**critical task**)., and they might close one of the containment spray head valves.

Once the crew has successfully isolated the steam generator and restored containment spray, the scenario may be terminated.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __1__ Page _3__ of _18__

Event Description: __Start MFW pump FW-4B per OP-2A Att. 4 Step 5.a.__

Time	Position	Applicant's Actions or Behavior
	BOPO	Start MFW pump using OI-FW-2. (OP-2A, Att. 4, Step 5.a)
	BOPO	Direct local operator to perform actions per OI-FW-2, Attachment 2. (Attachment 3, Step 1). Note: Actions have already been completed prior to turnover, including actions to start the auxiliary lube oil pump.
	BOPO	Ensure lockout relay is reset and amber indicating light is on for 86/FW-4B. (Attachment 3, Step 2)
	BOPO	Ensure 43/FW switch is in off and the 43/FW TRANSFER SWITCH OFF-AUTO alarm is in alarm (Step 3)
	BOPO	Ensure 43-SIAS/FW4 is in the FW-4B position. (Step 4)
	BOPO	Start FW pump FW-4B by placing control switch in AFTER-START. (Step 6)
	BOPO	Verify ammeter returns to less than 460 amps in less than 15 seconds and stabilizes for FW-4B. (Step 7.a)
	BOPO	Verify discharge isolation valve HCV-1150B opens and operates properly. (Step 7.b)
	BOPO	Verify auxiliary lube oil pump FW-30B stops. (Step 7.c)
	BOPO	Direct local operator to ensure HCV-1150B stem indicator goes to open position. (Step 8)
	BOPO	At discretion of shift manager, place 43/FW switch in AUTO and verify alarm clears. (Step 9). Note: cue this if asked.
		Event is terminated once the main feedwater pump is started.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __2__

Event Description: __Raise reactor power to 10% per OP-2A, Attachment 4, Step 5.__

Time	Position	Applicant's Actions or Behavior
	BOPO	Direct local operator to secure FW-54 by performing OI-AFW-4, Attachment 5, Steps 13-15. (OP-2A, Att. 4, Step 5.b)
	ATCO	Raise reactor power by dilution using OI-CH-4 Attachment 12
	ATCO	Record current boron concentration, desired boron concentration, and RCS Tavg. (Step 1) Note: may use reactivity sheets to determine approximate number of gallons of water to be added instead of Steps 1-2
	ATCO	Determine number of gallons of makeup water to be added using ERF computer per OI-ERFCS-1 or the dilution formula in TDB-V.12. (Step 2)
	ATCO	Record the number of gallons of makeup water to be added to the RCS. (Step 3) Note: During validation, crew added 10 gallons of water to the VCT.
	ATCO	Ensure HC-269, makeup water mode selector switch, is in DILUTE. (Step 4)
	ATCO	Ensure FCV-269, makeup water control valve, is in CLOSE. (Step 5)
	ATCO	Set FQS-269X, demin water makeup flow batching switch, to the desired number of gallons of water to be added. (Step 6) Note: will likely choose to added water in smaller batches, as allowed by note in procedure.
	ATCO	Record initial demineralized water makeup flow totalizer reading. (Step 7)
	ATCO	Open FCV-269. (Step 8)
	ATCO	Place FCV-269X in AUTO. (Step 9)
	ATCO	Set demineralized water flow to desired flow rate with FC-269X controller. (Step 10)
	ATCO	Verify VCT level and pressure respond as expected. (Step 11)
	ATCO	Place FCV-269X in CLOSE when dilution complete. (Step 13)
	ATCO	Close FCV-269 and record final demineralized water makeup flow totalizer reading. (Steps 14-15)
	ATCO	Verify amount of demineralized water added from flow totalizer is consistent with amount of water added. (Step 16)
	BOPO	Maintain RCS temperature 527-535 degrees F using steam dump and bypass valves. (OP-2A, Attachment 4, Step 5.c)
		Event can be terminated once reactivity effects are seen. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __3__ Page _5__ of __18_
Event Description: __Wide range log power NI-002 fails high. ______

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarms CB-4/A20 Window B-7, NUCLEAR INSTRUMENTATION CHANNEL INOPERATIVE, Window C-1, HIGH POWER RATE OF CHANGE CHANNEL TRIP, Window D-1, HIGH POWER RATE OF CHANGE CHANNEL PRETRIP, and Window E-4, HIGH POWER RATE OF CHANGE TRIP ENABLED.
	ATCO	Enter ARP-CB-4/A20, Window B-7
	ATCO	Verify nuclear instrumentation testing in progress. (Step 1) Testing is not in progress.
	ATCO	Check that the non-op light is on for one of the WRNI drawers. (Step 2). Determine that NI-002 has failed high.
	ATCO	Check the following on the WRNI drawer (Step 3): • Level test and rate test switches in OPR for WR NI drawers • NI drawer power-on lights are on for WR NI drawers
	ATCO	If a wide range channel is failed AND power is greater than 10^{-4} but less than 15%, go to AOP-15. (Step 6)
	CRS	Transition to AOP-15, Section II.
	ATCO	Stabilize the reactor. (Step 1). Note: ATCO will drive rods in slightly to counteract the positive reactivity from the dilution, using OI-RR-1, REACTOR REGULATING SYSTEM NORMAL OPERATION, Attachment 3, "Manual Sequential Mode Operation"
	ATCO	Review Notes.
	ATCO	Ensure an out-of-scan CEA is not selected as the target rod on CB-4. (OI-RR-1, Attachment 3, Step 1)
	ATCO	Verify REGULATING GROUP WITHDRAWAL PROHIBIT is clear. (Step 2)
	ATCO	Place Rod Control Mode Selector Switch in Manual Sequential position. (Step 3)
	ATCO	Review Note.
	ATCO	Place Manual Rod Control Switch to LOWER as required by the situation, then verify the following (Step 4): • Primary CEAPIS indicates motion in the proper direction • Secondary CEAPIS indicates motion in the proper direction • ERF (Page 302 or LPP) indicates motion in the proper direction
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __3__

Event Description: __Wide range log power NI-002 fails high.
____

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify the following group motion overlap (Step 5.b): • Group 3 starts when Group 4 is at 53 inches Note: Shouldn't reach this point during reactor stabilization
	ATCO	When the group is at the desired position, release Manual Rod Control Switch (Step 7).
	ATCO	Verify all CEA motion stops as indicated by the following (Step 9): • Primary CEAPIS • Secondary CEAPIS • ERF (Page 302 or LPP)
	ATCO	Place Rod Control Mode Selector Switch in OFF. (Step 11)
	ATCO	Verify at least two wide range channels are operable. (AOP-15, Section II, Step 2)
	CRS	Notify operations manager or work week manager of WR NI failure. (Step 3)
	ATCO	Place RPS TU-2 in either bypass or trip within one hour. (Step 4)
	CRS	Direct I&C to restore WR NI to service. (Step 5)
	CRS	Enter **T.S. 2.15(1).** Place inoperable channel in either bypass or tripped condition within one hour. Channel may be bypassed up to 48 hours. The specification applies to the wide range NI channel when reactor power is between 10^{-4} and 15% power
		Event is terminated once T.S. call is made or at lead examiner discretion. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __4__

Event Description: __MFW pump FW-4B trips, no autostart of backup pump.
____

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm CB-10,11/A12 Window A-6L, STEAM GEN FEED PUMP B OVERLOAD/TRIP
	BOPO	Enter ARP-CB-10,11/A12 Window A-6L
	BOPO	Dispatch an operator to check status of FW-4B. (Step 1)
Booth role plays at water plant operator when called to investigate FW-4B pump trip. Report back after a few minutes that it tripped on overcurrent.		
	BOPO	Start standby feedwater pump. (Step 2). Note: The ARP does not contain instructions about starting the auxiliary lube oil pump prior to starting MFW pump, however the nature of this failure has the lube oil pump start automatically. BOPO will start FW-4C.
	BOPO	Ensure 43-SIAS/FW4 Post SIAS Running Feedwater Pump is selected to FW-4C. (Step 2.2)
	BOPO	Check the following for the cause of the FW-4B trip (Step 2.4): • 49/FW-4B overcurrent relay tripped at 1A2 • Motor stopped from local stop pushbutton • Motor stopped from the 69 permissive switch • Low voltage on 4160V Bus 1A2 • Low oil pressure on feedwater pump • 86/FW-4B Feedwater Pump Motor Differential Overcurrent
	BOPO	Notify electrical maintenance of feedwater pump trip. (Step 2.5)
	BOPO	Place running pump in AFTER-START. (Step 2.6)
	BOPO	If desired, align another pump to standby by placing control switch for FW-4B in AFTER-STOP and the control switch for the pump in PULL-OUT to AFTER-STOP. (Step 3)
		Event is terminated once feedwater pump is operating. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __5__ Page __8_ of _18__

Event Description: __Controlling pressurizer level instrument 101X fails low. ________________

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm ARP-CB-1,2,3/A4 Window A-8, PRESSURIZER LEVEL HI-LO CHANNEL X and Window C-8, PRESSURIZER LEVEL LO-LO CHANNEL X.
	ATCO	Enter ARP-CB-1,2,3/A4 Window C-8.
	ATCO	Check pressurizer level on LIC-101Y. (Step 1)
	ATCO	Check RCS pressure. (A,B,C,D/PIA-102Y) (Step 2)
	ATCO	Ensure all pressurizer heaters are deenergized. (Step 3)
	ATCO	Check RCS cold leg temperature for decrease (Step 4)
	ATCO	Check VCT level for indication of decreasing level (Step 4.1)
	ATCO	If VCT level is decreasing, perform RCS leak rate test. (Step 4.2)
	ATCO	Check letdown flow at a minimum and all available charging pumps are running and supplying flow to the RCS. (Step 5)
	ATCO	Place pressurizer level control to channel Y (Step 6.1)
	ATCO	Place PZR heater cutout channel select switch to Y (Step 6.2)
	ATCO	Notify I&C. (Step 7)
		Note: If crew takes too long to swap from "bad" channel (Channel 101X) to "good" channel (Channel 101Y), the change in the setpoint error (Channel 101X reads 0% level, Channel 101Y reads >60% level) can cause a pressure "spike" in the letdown system, causing HCV-204, RC to Letdown Heat Exchanger, to close, isolating letdown. Alarm CB-1,2,3/A2 Window B1L, Intermediate Letdown Pressure HI/LO will alarm if this occurs.
		Event is terminated once level is controlled within band either manually or using channel Y. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __6__ Page __9_ of __18_

Event Description: __CCW pump AC-3A trips, no autostart of standby pump. ________________

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A2 Window D-3U, CCW PUMPS TRIP
	ATCO	Enter ARP-CB-1,2,3/A2 Window D-3U.
	ATCO	Verify standby CCW pumps have started. (Step 1)
	ATCO	If standby pump has not started, start a standby CCW pump. (Step 2) ATCO will start pump AC-3B.
	ATCO	Monitor CCW component temperatures and flows. (Step 3)
	BOPO	Direct local operator to check CCW pump breaker. (Step 5)
	ATCO	Notify maintenance of CCW pump trip. (Step 6)
	CRS	Enter **T.S. 2.4(1)(b).** Restore CCW pump to operability within 7 days or place in hot shutdown within 12 hours after that. If not restored within an additional 48 hours, enter cold shutdown within 24 hours.
		Note: Some other alarms may come in depending on how quickly the crew restores component cooling water flow. During validation, Alarm CB-1,2,3/A1 B5U came in for high seal cooler temperature on RC-3B.
		Event is terminated once CCW flow is restored and at lead examiner discretion. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __7__ Page _10__ of _18__		
Event Description: __Inadvertent AFAS (Aux. FW actuation signal).		

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarms AI-66A/A66A Window 44, AFWS STEAM GEN RC-2A CHANNEL A ACTUATED and Window 45, AFWS STEAM GEN RC-2B CHANNEL A ACTUATED
	CRS	Determine that AFAS actuated NOT required.
	CRS	Direct entry into AOP-28, Section II, Inadvertent AFW actuation
	BOPO	Verify AFAS is inadvertent. (Section II, Step 1)
	CRS	Refer to both T.S.'s 2.5 and 2.15. (Step 2)
	BOPO	Ensure both FCV-1368, FW-6 recirculation valve, and FCV-1369, FW-10 recirculation valve, are in AUTO. (Step 3)
	BOPO **(CT)**	**Place control switches for AFW isolation valves HCV-1107A, HCV-1107B, HCV-1108A, and HCV-1108B in CLOSE. (Step 4)**
	BOPO	Bypass affected channel or logic subsystem per OI-AFW-2
	CRS	Determine if an instrument channel or logic subsystem channel is to be bypassed. (OI-AFW-2, Attachment 1, Step 1). CRS determines that logic subsystem channel A is to be bypassed, and proceeds to Step 3.
	CRS	Log entry into **T.S. 2.15(3)** (OI-AFW-2, Attachment 1, Step 3.a)
	BOPO	Bypass selected Logic Subsystem using Table 2, Auxiliary Feedwater Actuation System Logic Subsystem Bypass Switch Alignment and record the As-Left information in the appropriate slots. (Step 3.b)
	BOPO	Stop all AFW pumps by: (AOP-28, Section II, Step 6)
	BOPO	Close YCV-1045, FW-10 steam inlet valve (Step 6.a)
	BOPO	Place isolation valve YCV-1045A override switch and isolation valve YCV-1045B override switch in OVERRIDE. (Step 6.b)
	BOPO	Close YCV-1045A and YCV-1045B, FW-10 steam supply valves. (Step 6.c)
	BOPO	Ensure FW-10 recirc flow drops to zero. (Step 6.d)
	BOPO	Stop FW-6, electric AFW pump, by placing HC-1367, FW-6 control switch, in PULL-TO-LOCK. (Step 6.e)
	BOPO	Ensure FW-6 recirc flow drops to zero.
	BOPO	Once affected channel is bypassed return AFW system to automatic: (Step 7)
		Event description is continued on the next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __7__ Page _11 __ of _18__

Event Description: __Inadvertent AFAS (Aux. FW actuation signal). Event is initiated at lead examiner's cue.

Time	Position	Applicant's Actions or Behavior
	BOPO	Place control switches for HCV-1107A, HCV-1107B, HCV-1108A, and HCV-1108B in RESET. (Step 7.a)
		Place control switches for HCV-1107A, HCV-1107B, HCV-1108A, and HCV-1108B in AUTO. (Step 7.b)
	BOPO	Place YCV-1045 control switch in RESET. (Step 7.c)
	BOPO	Place YCV-1045 control switch in AUTO. (Step 7.d)
	BOPO	Place isolation valve YCV-1045A override switch and isolation valve YCV-1045B override switch in NORMAL. (Step 7.e)
	BOPO	Place HC-1367, FW-6 control switch, in AFTER-STOP. (Step 7.f)
	BOPO	Ensure FW-64-RL, Aux Feed Pump FW-10 Manual Trip Latch Reset Lever, is latched. (Step 8)
	CRS	Enter T.S.'s: **TS 2.5(1)D** for two trains of AFW inoperable due to overriding and stopping AFW. This is then exited once AFW is restored to automatic. Actions are to initiate immediate actions to restore AFW and suspend T.S.'s requiring a mode change **TS 2.15(3)** for logic subsystem. 48 hour shutdown LCO.
		Note: Due to time constraints, examiners might secure from this event following performance of the critical task (to isolate the inadvertent AFW flow to the steam generators). This will result in AFW flow being overridden for the next event, and should be watched by the examiners to ensure that the candidates are aware of need to restore AFW flow before intact steam generator (RC-2B) level drops below 27% WR level.
		Event is terminated once AFW has been restored to automatic

Op-Test No.: _____ Scenario No.: _4___ Event No.: __8__			Page _12__ of _18__

Event Description: __Steam line break inside containment on RC-2A. Event is initiated at lead examiner's cue.

Time	Position	Applicant's Actions or Behavior
	CRS	Direct entry into EOP-00 and performance of SPTA's.
	ATCO	Verify reactor power lowering, startup rate negative, and no more than one regulating/shutdown CEA not inserted. (Step 1.a)
	ATCO	Monitor for an uncontrolled RCS cooldown. (Step 1.b). Transition to contingency action.
	BOPO	CRS may direct BOPO to close all MSIV's due to the uncontrolled cooldown.
	ATCO	Emergency borate. (Step 1.2) Note: emergency boration should automatically initiate due to SIAS
	ATCO	Ensure both FCV-269X and FCV-269Y are closed. (Step 1.2.a)
	ATCO	Open HCV-268, HCV-265, and HCV-258. (Step 1.2.b)
	ATCO	Start all boric acid and charging pumps. (Step 1.2.c)
	ATCO	Close LCV-218-2, VCT outlet valve. (Step 1.2.d)
	ATCO	Ensure LCV-218-3, HCV-257, and HCV-264 are closed. (Step 1.2.e)
	ATCO	Borate until adequate shutdown established. (Step 1.2.f)
	BOPO	Verify turbine tripped by stop and intercept valves indicating closed. (Step 2)
	BOPO	Ensure generator output breakers 3451-4 and 3451-5 and generator field breaker 41E/G1F are tripped. (Step 3)
	BOPO	Verify buses 1A3 and 1A4 are energized. (Step 4)
	BOPO	If SIAS has occurred, ensure both diesel generators have started. (Step 5)
	BOPO	Check buses 1A1 and 1A2 are energized. (Step 6)
	BOPO	Check 125 VDC buses 1 and 2 are energized. (Step 7)
	BOPO	Verify instrument air available with IA pressure greater than or equal to 90 psig and at least one air compressor operating. (Step 8)
	ATCO	Ensure at least one CCW pump operating with discharge pressure greater than or equal to 60 psig and at least one raw water pump operating. (Step 9.a-c)
	ATCO	Ensure RCP coolers CCW valves are open. (Step 9.d)
		Event description is continued on next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __8, 9__ Page _13__ of _18__
Event Description: __Steam line break inside containment on RC-2A. Event is initiated at lead examiner's cue. SGIS fails, and manual action must be taken to isolate steam generator RC-2A.

Time	Position	Applicant's Actions or Behavior
	ATCO	Verify pressurizer level is 30-70%, trending to 45-60% with an RCS subcooling greater than or equal to 20 degrees. Transition to contingency. (Step 10)
	ATCO	Manually control charging and letdown to restore pressurizer level. (Step 10.1.a)
	ATCO	Verify RCS pressure 1800-2300 psia, trending to 2050-2150 psia, and PORVs are closed. (Step 11). Transition to contingency actions.
	ATCO	If RCS pressure less than or equal to 1350 psia, trip one RCP in each loop. (step 11.2)
	ATCO	If RCS pressure less than or equal to 1600 psia, ensure emergency boration in progress and SI flow acceptable per Attachment 3. (Step 11.3.a-b)
	ATCO	If RCS pressure less than or equal to 1600 psia, ensure VIAS has initiated (86A/VIAS, 86B1/VIAS, 86B/VIAS, 86A1/VIAS) and CIAS has initiated (86A/CIAS, 86B1/CIAS, 86B/CIAS, 86A1/CIAS)
	ATCO	Manually control pressurizer heaters and spray to restore RCS pressure. (Step 11.4)
	ATCO	Verify RCP NPSH requirements are satisfied, at least one RCP is operating, and core ΔT less than or equal to 10 degrees F. (Step 12)
	BOPO	Verify MFW is restoring level in at least one S/G to 35-85%. (Step 13)
	BOPO	Ensure both feed reg valves have ramped closed. (Step 13.a)
	BOPO	Ensure both feed reg bypass valves have ramped to 40-45%. (Step 13.b)
	BOPO	Place 43/FW switch in OFF and ensure no more than one feed pump running. (Step 13.c&d)
	BOPO	Ensure no more than one condensate pump running and stop all heater drain pumps. (Step 13.e&f)
	BOPO	Ensure both sets of S/G blowdown isolation valves are closed. (Step 13.g)
		Note: Due to the uncontrolled heat extraction event, the operators may have already isolated feed to RC-2A.
	BOPO	Verify steam dump and bypass valves are controlling both RCS Tcold 525-535 degrees F and S/G pressure 850-925 psia. (Step 14). Transition to contingency action.
		Event description is continued on next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __8, 9__ Page _14__ of _18__
Event Description: __Steam line break inside containment on RC-2A. Event is initiated at lead examiner's cue. SGIS fails, and manual action must be taken to isolate steam generator RC-2A.

Time	Position	Applicant's Actions or Behavior
	BOPO	Stop cooldown by closing steam dump and bypass valves, atmospheric dump valve, and directing a local operator to check both air assisted main steam safety valves closed. (Step 14.2.a-c)
	BOPO	If S/G pressure less than 700 psia, isolate main steam header by closing both MSIV's and both MSIV bypass valves. (Step 14.2.d)
	BOPO **(CT)**	If S/G pressure less than or equal to 500 psia, ensure SGIS closes all of the following valves: HCV-1041A, HCV-1041C, HCV-1042A, HCV-1042C, HCV-1105, HCV-1106, HCV-1386, HCV-1385, HCV-1103, HCV-1104. (Step 14.2.e). **Note: Critical task will be for the BOPO to take actions required by SGIS due to a failure of SGIS prior to exiting EOP-00 Step 14.2.e. The AFW-10 steam supply valve YCV-1045A is not part of SGIS and is closed later in EOP-5 step 16.**
	BOPO	Steam S/G RC-2B prior to an uncontrolled Tcold rise of 5 degrees F or 27%WR level on RC-2A by operating air assisted main steam safety valve MS-292. (Step 14.2.f)
	ATCO	If Tcold is less than 500 degrees F, ensure at least one RCP is stopped. (Step 14.3)
	ATCO	Verify normal containment conditions. (Step 15)
	ATCO	No unexpected rise in containment sump level. (Step 15.a)
	ATCO	Check no containment area radiation monitor alarms. (Step 15.b)
	ATCO	Verify RM-051, RM-052, and RM-062 not in alarm. (Step 15.c)
	ATCO	Verify RM-054A, RM-054B, and RM-057 are not in alarm or trending upward. (Step 15.d&e)
	ATCO	Verify containment pressure less than 3.0 psig and temperature less than 120 degrees F. (Step 15.f). Transition to contingency action.
	ATCO	Start VA-3A, VA-7C, VA-3B, VA-7D. (Step 15.f.1.1)
	ATCO	Ensure CCW supplied to coils of operating containment vent fans. (Step 15.f.1.2)
	ATCO	If containment pressure greater than or equal to 5 psig, verify engineered safeguards are actuated. (Step 15.f.2)
	ATCO	Ensure emergency boration in progress. (Step 15.f.2.1)
	ATCO	Ensure SI flow acceptable. (Step 15.f.2.2)
		Event description is continued on next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __8, 9, 10__

Event Description: __Steam line break inside containment on RC-2A. Event is initiated at lead examiner's cue. SGIS fails, and manual action must be taken to isolate steam generator RC-2A. When CSAS occurs, containment spray pump 3A shaft shears and pump 3B fails to automatically start, but can be started from the control room.

Time	Position	Applicant's Actions or Behavior
	ATCO	Ensure VIAS has initiated. (Step 15.f.2.3)
	ATCO	Ensure CIAS has initiated. (Step 15.f.2.4)
	BOPO	Ensure SGIS has closed HCV-1041A, HCV-1041C, HCV-1042A, HCV-1042C, HCV-1105, HCV-1106, HCV-1386, HCV-1385, HCV-1103, and HCV-1104. (Step 15.f.2.5)
	ATCO **(CT)**	If containment pressure is greater than or equal to 5 psig, RCS pressure is less than or equal to 1600 psia, and at least one S/G pressure is less than or equal to 500 psia, ensure containment spray is greater than or equal to 2300 gpm with only one spray pump per header. (Step 15.f.3). **Critical task is to start either containment spray pump 3B or 3C and obtain 2300 gpm flow prior to exiting this procedure step.**
	CRS	Use Section 6.0 to determine appropriate procedure to implement. (Step 16)
	CRS	Determine need to transition to EOP-05, Uncontrolled Heat Extraction Event
	CRS	Confirm SPTA's have been performed. (EOP-05, Step 1)
	CRS	Confirm diagnosis of UHE by verifying safety function status check acceptance criteria are being maintained. (Step 2)
	CRS	Implement the Emergency Plan. (Step 3)
	ATCO/BOPO	Monitor the floating steps. (Step 4)
	ATCO	If RCS pressure less than 1600 psia, containment pressure greater than 5 psig, and at least one steam generator pressure less than or equal to 500 psia, verify containment spray flow is greater than or equal to 2300 gpm with only one spray pump per header. (Step 5.a). If not performed in EOP-00, transition to contingency action.
	ATCO	Restore containment spray by starting the idle containment spray pumps. (Step 5.a.1.2)
	ATCO	If only one CS pump is operating, ensure either HCV-344 or HCV-345 is closed. (Step 5.b). If ATCO started 3B, HCV-345 must be closed. If ATCO started 3C, either HCV-344 or HCV-345 must be closed.
	ATCO	Initiate containment cooling by starting all available containment vent fans and ensuring CCW is supplied to the coils of the operating vent fans. (Step 5.c)
		Event description is continued on next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __8, 9, 10__			Page _16__ of _18__

Event Description: __Steam line break inside containment on RC-2A. Event is initiated at lead examiner's cue. SGIS fails, and manual action must be taken to isolate steam generator RC-2A. When CSAS occurs, containment spray pump 3A shaft shears and pump 3B fails to automatically start, but can be started from the control room.

Time	Position	Applicant's Actions or Behavior
	BOPO	Ensure SGIS has closed valves (see above sections for list of valves). (Step 5.d)
	ATCO	If RCS pressure less than or equal to 1600 psia, verify emergency boration and SI flow. (Step 6)
	ATCO	If containment pressure greater than or equal to 5 psig, verify CPHS, CIAS, VIAS have initiated, emergency boration in progress, and SI flow is acceptable. (Step 7.a-e)
	BOPO	Ensure SGIS has closed valves (see above sections for list of valves). (Step 7.f)
	ATCO	Optimize SI and charging flow to RCS by operating either HPSI pumps SI-2A/B or SI-2B/C, LPSI pumps SI-1A/B, and charging pumps CH-1A/B/C. (Step 8).
	ATCO	If Tcold is less than 500 degrees F, ensure at least one RCP is stopped. (Step 9.a)
	ATCO	If RCS pressure is less than or equal to 1350 psia, ensure no more than 1 RCP running in each loop. (Step 9.b)
	ATCO	Verify normal CCW/RW system operation with at least two CCW pumps running with discharge pressure greater than or equal to 60 psig, at least 2 raw water pumps running, 3 CCW heat exchangers in service, and all RCP cooler CCW valves are open. (Step 10)
	CRS	N/A step 11 since affected steam generator should be identified by this time.
	CRS	Transition to Step 12.1 since UHE is not isolated.
	ATCO	Emergency borate. (Step 12.1)
	BOPO	Ensure SGIS has closed required valves (see earlier portion for list). (Step 13)
	BOPO	Identify most affected S/G by downward trends in steam pressure, level, or RCS Tcold (Step 14)
	CRS	Transition to Step 16.
	BOPO	Isolate RC-2A (Step 16)
	BOPO	Close the following valves: HCV-1041A, HCV-1041C, MS-291, FCV-1101, HCV-1105, HCV-1386, HCV-1103, HCV-1388A, HCV-1388B, HCV-1107A, HCV-1107B, MS-298. (Step 16.a)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: _4___ Event No.: __8, 9, 10__ Page _17__ of __18_

Event Description: __Steam line break inside containment on RC-2A. Event is initiated at lead examiner's cue. SGIS fails, and manual action must be taken to isolate steam generator RC-2A. When CSAS occurs, containment spray pump 3A shaft shears and pump 3B fails to automatically start, but can be started from the control room.

	BOPO	Override and close YCV-1045A. (Step 16.b)
	BOPO	If sampling not in progress, close both HCV-2506A and HCV-2506B (Step 16.c)
	BOPO	Verify most affected steam generator is isolated. (Step 17)
	BOPO	Direct local operator to open breaker MCC-4C1-F03, HCV-1042C main steam bypass valve and locally open HCV-1042C. (Step 18.1.b.1-2)
	BOPO	Steam S/G RC-2B using steam dump and bypass valves. (Step 19)
		Note: AFAS might still be overridden near the end of the scenario depending on how far they get in event 7 to restore from the inadvertent actuation of AFAS, in which case the examiners need to be sure the operators are aware of the need to align feed to RC-2B before it reaches 27% WR level.
		Event can be terminated once RC-2A is isolated and decay heat is being removed by RC-2B.

Procedure Number	Procedure Title	Revision
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Scenario # 4 Malfunction List

Event #	Description	Type	System	Command	Severity	Ramp
1	Start FW-4B	Normal				
2	Raise power to 10%	Normal				
3	NI-002 Fails High	MALF MALF	NIS NIS	NIS36 NIS03	200% FAIL	1 sec delay
4	FW-4B Trips	MALF	FWC	BUS_1A2_8_BKR_TRIP	TRUE	
5	Pressurizer Level fails Low	TRAN	RRS	RCS_LT101X	0%	
6	AC-3A trips	MALF	CCW	BUS_1B3B_4_BKR_TRIP	TRUE	
7	Inadvertent AFAS	MALF	AFW	A_RC_2A_AFAS	Deenergize	
8	SLB inside Containment	MALF	SGN	SGN01A	10%	
9	SGIS Fails (preset)	MALF	ESF	ESF27 ESF28	BLOCK BLOCK	
10	SI-3B fails to start (preset)	OVR	ECC	Sequencer switches	OFF	
	SI-3A Shaft Shear (preset)	Engineering mode drawing malfunction Ecc_SI3A_M Shaft Shear Status TRUE				