Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-1 Rev. 3

JPM Title: Shutdown margin with inoperable CEA

Location: Classroom

Approximate Time: 20 minutes Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): K/A 2.1.37 (RO Imp: 4.3)
Knowledge of procedures, guidelines, or limitations associated with reactivity| management.
TDB-V.9 "Shutdown Margin Worksheet"
TDB-II "Reactivity Curves"
RE-ST-RX-0008 "SHUTDOWN MARGIN VERIFICATION DURING HOT SHUTDOWN, COLD SHUTDOWN OR REFUELING"

Handout(s): GARDEL Printout

Task List #: 0062

Applicable Position(s): RO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ____________

JPM Reviewed by: ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-1 Rev. 3

JPM Title: Shutdown margin with inoperable CEA

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:	Technical Data Book, RE-ST-RX-0008, calculator
Safety Considerations:	None
Comments:	Student may or may not use RE-ST-RX-0008.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-1 Rev. 3

JPM Title: Shutdown margin with inoperable CEA

TASK STANDARD:	**Shutdown margin with inoperable CEA has been determined.**

INITIAL CONDITIONS:	**The plant is operating at 100% power with all CEAs fully withdrawn. Group 2 CEA #27 has been declared inoperable (untrippable).** **The latest GARDEL information is attached.**

INITIATING CUE:	**You have been requested to perform an instantaneous shutdown margin calculation to determine if technical specification requirements for shutdown margin are being met.**

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-1 Rev. 3

JPM Title: Shutdown margin with inoperable CEA

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Obtain a copy of TDB-V.9 Student may also obtain or request copy of RE-ST-RX-0008.	Applicant located appropriate procedure(s). **CUE: After candidate locates TDB-V.9 in the Technical Data Book, provide a copy of TDB-V.9-I. If candidate locates or requests copy of RE-ST-RX-008, provide a copy.** [SAT] [UNSAT]
2.	Obtain a copy of TDB section II, Reactivity Curves.	Applicant obtained copy of TDB-II. [SAT] [UNSAT]
3.	Determines part I of TDB-V.9 should be used.	Applicant performed calculation using part 1 of TDB-V.9. [SAT] [UNSAT]
4.	Performs calculation of the difference between actual and required shutdown margin.	Applicant calculated the difference on line 12 of TDB-V.9-1 is -0.594 [Band = -0.614, -0.574] [SAT] [UNSAT]
5.	Determines if SDM is adequate	Shutdown margin is adequate [SAT] [UNSAT]

Termination Criteria: Shutdown margin with inoperable CEA has been determined.

ANSWER KEY

TDB-V.9 - 1	"VALIDATED"		
1. Present Date/Time	3/27/14 / 1417		
2. Reactor Power (before trip)	100% %		
3. CEA Positions:			
a. Group 1	126 inches		
b. Group 2	126 inches		
c. Group 3	126 inches		
d. Group 4	126 inches		
4. RCS Boron Concentration	844 ppm		
5. Burnup	2447 MWD/MTU		
6. Regulating Group Worth	3.21 % Δρ		
a. Figure Used	II.B.2.a		
7. Shutdown Worths			
a. Group A	1.777 % Δρ		
b. Group B	3.107 % Δρ		
c. Total Shutdown Worth (Step 7.a + Step 7.b)	4.884 % Δρ		
8. Power Defect		JPM BAND	
a. Power Defect per Percent power	0.0152 % Δρ / %	0.0150	0.0154
b. Total Power Defect (Step 2 X Step 8a.)	1.52 % Δρ	1.50	1.54
9. Stuck CEA Allowance			
a. Highest CEA Worth	N/A % Δρ		
b. Inoperable CEA Worth	2.38 % Δρ		
c. Multiple Inoperable CEAs	N/A		
i. Number of Inoperable CEAs			
ii. Most Conservative CEA Worth	% Δρ		
iii. Total Inoperable CEA Worth (Step 9.c.i X Step 9.c.ii)	% Δρ		
iv. Total Available CEA Worth	% Δρ		
v. Multiple Stuck CEA Worth (Step 9.c.iii or Step 9.c.iv)	% Δρ		
d. Stuck CEA Allowance Value (9.a Step or 9.b or 9.c.v)	2.38 % Δρ		
10. Instantaneous Shutdown Margin= Step 9.d + Step 8.b – Step 7.c – Step 6	−4.194 % Δρ	-4.214	-4.174
11. Tech. Spec. Shutdown Margin	3.6 % Δρ		
12. Shutdown Margin (Step 10 + Step 11)	−0.594 % Δρ	-0.614	-0.574
13. Is Shutdown Margin Adequate?	YES (≤ 0) / NO (> 0)		

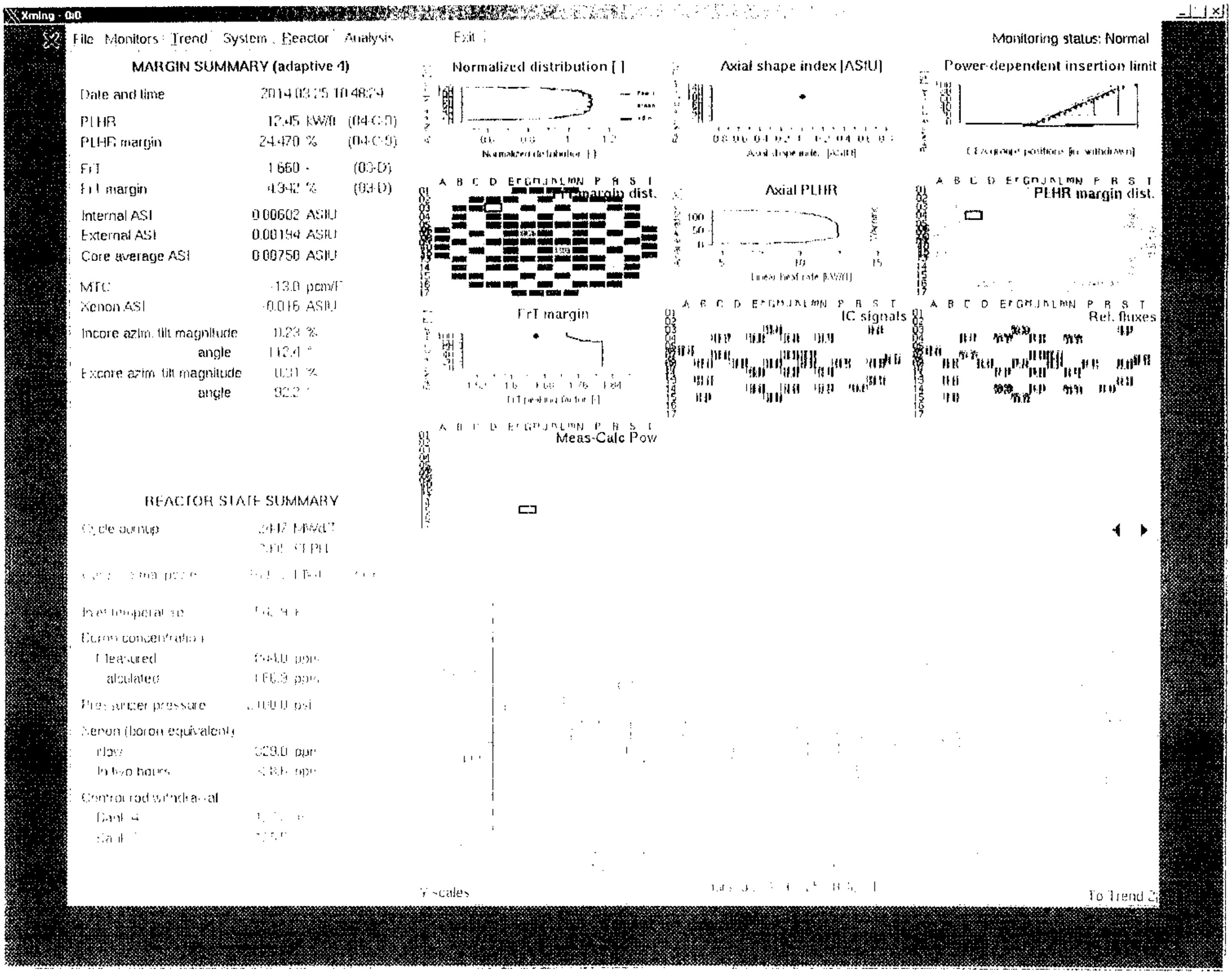
ANSWER KEY

NAME: ______________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS:	**The plant is operating at 100% power with all CEAs fully withdrawn. Group 2 CEA #27 has been declared inoperable (untrippable).** **The latest GARDEL information is attached.**

INITIATING CUE:	**You have been requested to perform an instantaneous shutdown margin calculation to determine if technical specification requirements for shutdown margin are being met.**


Xming - 0.0
File Monitors Trend System Reactor Analysis Exit
Monitoring status: Normal
MARGIN SUMMARY (adaptive 4)
Date and time 2014.03.25 10:48:29
PLHR 12.45 kW/ft (04-C-9)
PLHR margin 24.470 % (04-C-9)
FrT 1.660 - (03-D)
FrT margin 4.342 % (03-D)
Internal ASI 0.00602 ASIU
External ASI 0.00194 ASIU
Core average ASI 0.00750 ASIU
MTC -13.0 pcm/F
Xenon ASI -0.016 ASIU
Incore azim. tilt magnitude 0.23 %
angle 112.4 °
Excore azim. tilt magnitude 0.31 %
angle 92.2 °
REACTOR STATE SUMMARY
Cycle burnup
Inlet temperature
Boron concentration
Measured
Calculated
Pressurizer pressure
Xenon (boron equivalent)
now
In two hours
Control rod withdrawal
Normalized distribution [ ]
Axial shape index [ASIU]
Power-dependent insertion limit
FrT margin dist.
Axial PLHR
PLHR margin dist.
FrT margin
IC signals
Rel. fluxes
Meas-Calc Pow
Y-scales
To Trend 2

Fort Calhoun Station
Unit 1

TDB-V.9

TECHNICAL DATA BOOK

SHUTDOWN MARGIN WORKSHEET

Change No.	EC 55737, 55738
Reason for Change	Change requirement in Condition Step 4 Parts I and II, to require RCS boron analysis to be performed within the past 72 hours vice 24 hours (EC 55738). Incorporate a table method to simplify the calculation. Reformat to a simpler approach (EC 55737). Major Change, no rev bars used.
Requestor	J. Willett, K. Kingston
Preparer	K. Bessey
Issue Date	05-21-13 3:00 pm

SHUTDOWN MARGIN WORKSHEET

PART I - Instantaneous Shutdown Margin for use prior to a Reactor Trip or immediately following a Reactor trip. No changes are assumed for either boron or xenon, since this worksheet is only applicable for calculation of an instantaneous shutdown margin.

NOTE: Enter values in **Table TDB-V.9-1,** exactly as determined from the figures in the Technical Data Book and carry the algebraic signs through the calculations.

Plant Conditions

1. Record Present Date/Time

2. Record Reactor Power (before trip)

3. Record CEA Group Positions

4. Record Reactor Coolant System Boron Concentration prior to shutdown (Boron concentration analysis must have been performed within the past 72 hours or more recently if boration or dilution has occurred)

5. Record Burnup - Take the most recent burnup from GARDEL OR take the most recent Burnup from the Control Room Log and add 30 MWD/MTU per EFPD to the Control Room Log Burnup Value.

Calculation of Shutdown Margin

6. Enter Regulating Group Worth, based on burnup (Step 5) and CEA positions using TDB Figure II.B.2.

7. Enter Shutdown Group Worths, based on burnup (Step 5) using TDB Figure II.B.1.a.

   a. Sum the total shutdown CEA worth by adding Group A (7.a) and Group B (7.b) and recording in line 7.c.

8. Determine Power Defect

   a. Enter Power Defect based on Reactor power level (Step 2) and burnup (Step 5) using TDB Figure II.C.2.b.

   b. Calculate power defect by multiplying Reactor Power Level (Step 2) by Power Defect per Percent Reactor Power (Step 8.a).

9. Determination of Stuck CEA Allowance (3 cases)

NOTE: Consider dropped CEAs which cannot be verified to be fully inserted as inoperable.

a. Case I - All CEAs are assumed to be operable. (No known inoperable CEAs)

(Enter N/A if this case is not applicable.)

Assume the highest worth CEAs will stick out of the core upon a Reactor trip. Enter the value of the most reactive CEA, based on burnup (Step 5), from TDB Figure II.B.1.b., lines (1) thru (3) for the pre-trip configuration. Select the higher value.

NOTE: The worth of one inoperable CEA is dependent on the configuration of the withdrawn group(s) and the inoperable CEA.

b. Case II - One CEA is known to be inoperable (per Technical Specification 2.10.2(4) a.)

(Enter N/A if this case is not applicable.)

Account for this defective CEA (and the highest worth stuck CEA) by entering only the value from lines (4) thru (17) of TDB Figure II.B.1.b. for the inoperable CEA, based on burnup (Step 5). Select the higher value.

NOTE: The worth of more than one inoperable CEA is calculated by multiplying the most conservative Stuck CEA plus Ejected CEA Worth (TDB Figure II.B.1.b. lines 4-17 by the number of inoperable CEAs).

NOTE: The values of lines (4) thru (17) of TDB Figure II.B.1.b. Include the total reactivity associated with the known inoperable CEA and the highest worth CEA which is assumed to stick out of the core upon a Reactor trip.

c. Case III - More than one CEA is known to be inoperable (per Technical Specification 2.10.2.(4)a.).

(Enter N/A if this case is not applicable.)

i. Enter total number of CEA's which are known to be inoperable per Technical Specification 2.10.2.(4) a.

ii. Enter the most conservative defective CEA worth from TDB Figure II.B.1.b. Lines (4) thru (17) depending on inoperable CEA(s) location, based on burnup (Step 5). Select the higher value.

iii. Multiply the total number of inoperable CEA's (Step 9.c.i) by the highest/ most conservative CEA Worth (Step 9.c.ii).

9.c

iv. Enter total available CEA worth from TDB Figure II.B.1.a. based on burnup (Step 5) (Use Worth Without Group N value unless Group N Rods are inserted.)

NOTE: The Rod Worth Value found in Step 9.c.iv, is the maximum CEA Worth possible, therefore using the lesser of the two values from Steps 9.c.iii and 9.c.iv is more accurate and conservative.

v. Determine the Multiple Stuck CEA Worth by selecting the minimum of either Step 9.c.iii or Step 9.c.iv and record that value.

d. Enter Stuck CEA Allowance value from Step 9.a or 9.b or 9.c.v as appropriate.

10. Calculation of the Total Instantaneous Shutdown Margin (SDM_I):

SDM_I = Stuck CEAs (Step 9.d) + Power Defect (Step 8.b) - S/D CEAs worth (Step 7.c) - Regulating CEA worth (Step 6)

11. Document the Technical Specification required Shutdown Margin per TS 2.10.1(1).

12. Calculate difference from required Shutdown Margin per TS 2.10.2(1).

NOTE: A 3.6% $\Delta\rho$ shutdown margin must be maintained in a Hot Shutdown condition, Tc > 210°F and a 3.0% $\Delta\rho$ Shutdown Margin must be maintained T_c<210°F. (Technical Specification 2.10.2(1) and TDB-VI Item 13.0).

13. Shutdown Margin check:

a. If Step 12 is less than or equal to zero, the shutdown margin is adequate.

b. If Step 12 is greater than zero, use OI-ERFCS-1, to determine the number of gallons of acid to add.

REMARKS
____
____
____
____

Completed by ______________________________ Date/Time ______/______

TDB-V.9 - 1	
1. Present Date/Time	/
2. Reactor Power (before trip)	%
3. CEA Positions:	
a. Group 1	inches
b. Group 2	inches
c. Group 3	inches
d. Group 4	inches
4. RCS Boron Concentration	ppm
5. Burnup	MWD/MTU
6. Regulating Group Worth	% Δρ
a. Figure Used	
7. Shutdown Worths	
a. Group A	% Δρ
b. Group B	% Δρ
c. Total Shutdown Worth (Step 7.a + Step 7.b)	% Δρ
8. Power Defect	
a. Power Defect per Percent power	% Δρ / %
b. Total Power Defect (Step 2 X Step 8a.)	% Δρ
9. Stuck CEA Allowance	
a. Highest CEA Worth	% Δρ
b. Inoperable CEA Worth	% Δρ
c. Multiple Inoperable CEAs	
i. Number of Inoperable CEAs	
ii. Most Conservative CEA Worth	% Δρ
iii. Total Inoperable CEA Worth (Step 9.c.i X Step 9.c.ii)	% Δρ
iv. Total Available CEA Worth	% Δρ
v. Multiple Stuck CEA Worth (Step 9.c.iii or Step 9.c.iv)	% Δρ
d. Stuck CEA Allowance Value (9.a Step or 9.b or 9.c.v)	
10. Instantaneous Shutdown Margin= Step 9.d + Step 8.b – Step 7.c – Step 6	% Δρ
11. Tech. Spec. Shutdown Margin	3.6 % Δρ
12. Shutdown Margin (Step 10 + Step 11)	% Δρ
13. Is Shutdown Margin Adequate?	YES(≤ 0) / NO (> 0)

Figure II.B.1.a

Table 1 - Fort Calhoun Station Cycle 27
CEA Group Worths at HZP in %Δρ
When Inserted Sequentially

CEA Group	Burnups (GWD/MTU)								
	0	2	4	6	8	10	12	14	15
4	0.416	0.424	0.427	0.429	0.430	0.423	0.420	0.432	0.441
3	0.546	0.570	0.562	0.553	0.542	0.534	0.542	0.550	0.555
2	1.350	1.324	1.343	1.358	1.367	1.369	1.371	1.397	1.417
1	0.873	0.898	0.928	0.962	1.002	1.058	1.105	1.115	1.116
*N	0.556	0.565	0.596	0.630	0.668	0.722	0.764	0.768	0.765
*B	3.134	3.107	3.040	2.974	2.901	2.805	2.729	2.735	2.756
*A	1.773	1.777	1.876	1.982	2.109	2.224	2.259	2.309	2.340
[*A+B]	4.907	4.884	4.916	4.956	5.010	5.029	4.988	5.044	5.096
Total Worth (w/ N)	8.648	8.665	8.772	8.888	9.019	9.135	9.190	9.306	9.390
Total Worth (w/o N)	7.677	7.694	7.751	7.813	7.878	7.917	7.953	8.083	8.170

*Group N's worth increases significantly after Groups A and B are inserted.

Table 2 - Fort Calhoun Station Cycle 27
CEA Groups 1 - 4 Worth of the Bottom 20 Inches at HZP in %Δρ

Table 2 - Fort Calhoun Station Cycle 27
CEA Groups 1 - 4 Worth of the Bottom 20 Inches at HZP in %Δρ

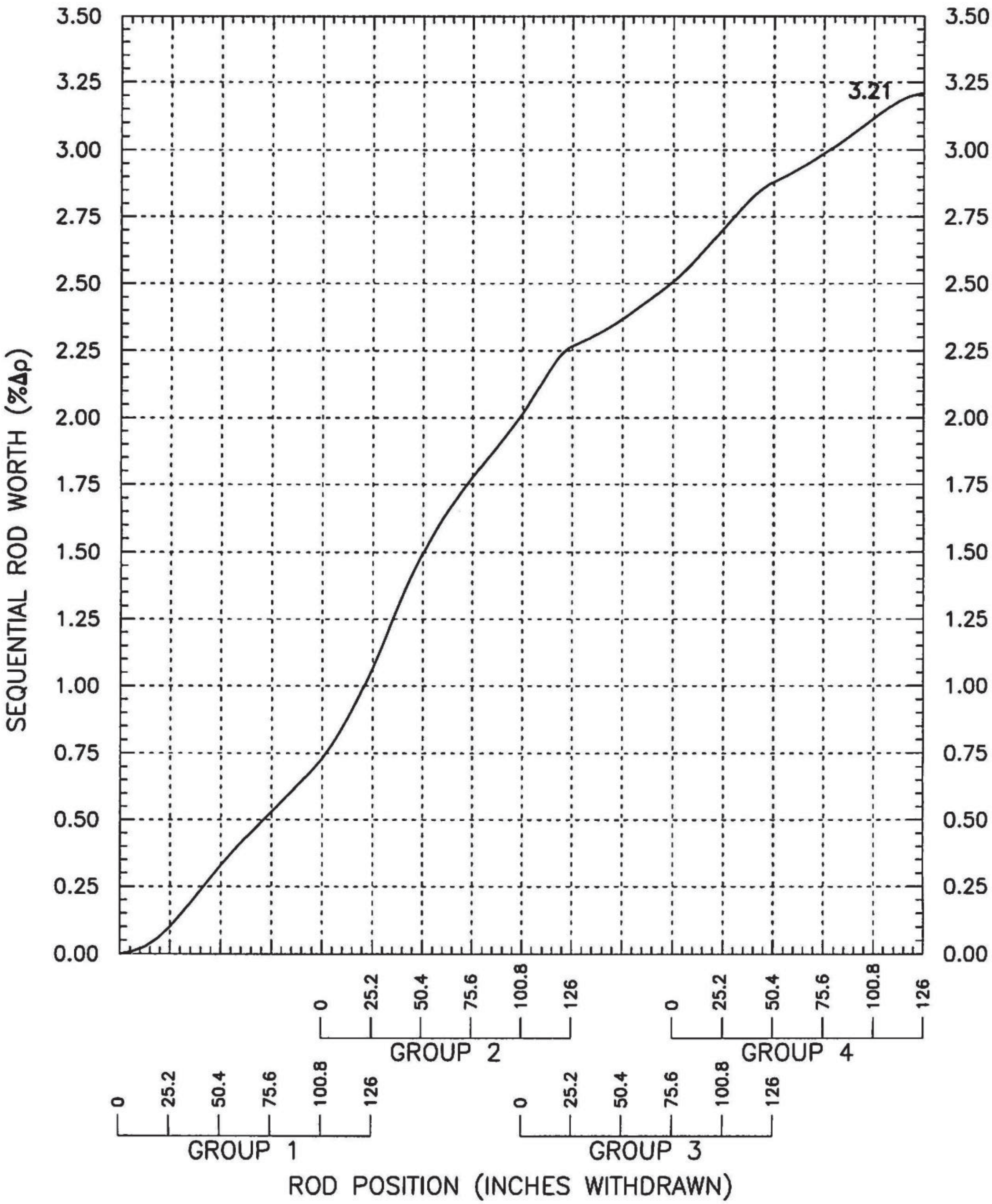
CEA Groups 1-4	Burnups (GWD/MTU)								
	0	2	4	6	8	10	12	14	15
Group N In	0.824	0.856	0.873	0.858	0.808	0.742	0.677	0.621	0.610
Group N Out	0.908	0.929	0.943	0.922	0.869	0.800	0.728	0.659	0.647

Figure II.B.1.b - Fort Calhoun Station Cycle 27
Reduction in Shutdown Margin or Stuck CEA(s) Worth (%Δρ)

Condition*	Exposure (GWD/MTU)								
	0	2	4	6	8	10	12	14	15
ARO; No Known Inoperable	1.36	1.32	1.24	1.17	1.09	1.00	0.99	1.05	1.07
Group 4 In; No Known Inoperable	1.36	1.32	1.24	1.17	1.09	1.00	0.99	1.05	1.07
Groups 4+3 In; No Known Inoperable	1.36	1.32	1.24	1.17	1.09	1.00	0.99	1.05	1.07
ARO; Rod 1-6, 1-8, 1-10, or 1-12 Inoperable	2.12	2.10	2.05	2.00	1.96	1.91	1.87	1.87	1.89
ARO; Rod 2-22 or 2-26 Inoperable	2.12	2.08	2.11	2.12	2.11	2.07	2.02	2.07	2.13
ARO; Rod 2-23 or 2-27 Inoperable	2.42	2.38	2.46	2.54	2.63	2.70	2.75	2.85	2.92
ARO; Rod 2-24 or 2-28 Inoperable	2.40	2.30	2.30	2.29	2.26	2.20	2.13	2.18	2.24
ARO; Rod 2-25 or 2-29 Inoperable	2.28	2.29	2.39	2.49	2.59	2.68	2.73	2.84	2.91
ARO; Rod 3-2, 3-3, 3-4, or 3-5 Inoperable	1.97	1.96	1.90	1.83	1.76	1.67	1.62	1.66	1.69
ARO; Rod 4-1 Inoperable	1.79	1.77	1.70	1.64	1.57	1.48	1.45	1.52	1.56
ARO; Rod 4-38, 4-39, 4-40, or 4-41 Inoperable	1.85	1.80	1.72	1.64	1.55	1.42	1.38	1.46	1.50
ARO; Rod A-30 or A-34 Inoperable	2.34	2.30	2.26	2.22	2.18	2.11	2.03	2.06	2.10
ARO; Rod A-31 or A-35 Inoperable	2.74	2.71	2.71	2.71	2.73	2.72	2.75	2.85	2.92
ARO; Rod A-32 or A-36 Inoperable	2.32	2.27	2.23	2.19	2.15	2.08	2.00	2.03	2.07
ARO; Rod A-33 or A-37 Inoperable	2.75	2.73	2.73	2.74	2.76	2.76	2.74	2.84	2.91
ARO; Rod B-14 or B-16 Inoperable	2.74	2.71	2.71	2.71	2.73	2.72	2.70	2.76	2.81
ARO; Rod B-15 or B-17 Inoperable	2.75	2.73	2.73	2.74	2.76	2.76	2.74	2.80	2.84

*Inoperable rod is assumed to be "stuck out." All groups not specifically inserted are assumed to be 100% withdrawn.

Figure II.B.2.a - Cycle 27 Sequential Rod Worth vs. Rod Position
(HZP, 0 to 5 GWD/MTU)
GROUPS 1-4



Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-2 Rev. 1

JPM Title: Time to empty EFWST

Location: Classroom

Approximate Time: 10 minutes Start Time:__________________

End Time:__________________

Actual Time: _________________

Reference(s): K/A 2.1.25 (RO Imp: 3.9)
Ability to interpret reference materials, such as graphs, curves, tables, etc.
AOP-30
TDB VII EFWST Tank Curve

Handout(s): AOP-30 Attachment A
TDB-VII, EFWST Tank Curve

Task List #: 0780

Applicable Position(s): RO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ___________

JPM Reviewed by: ______________________________ Date: ___________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-2 Rev. 1

JPM Title: Time to empty EFWST

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: None

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-2 Rev. 1

JPM Title: Time to empty EFWST

TASK STANDARD:	**The time to empty the EFWST has been determined.**

INITIAL CONDITIONS:	**A loss of feedwater has occurred. FW-6 is being used to provide auxiliary feedwater to the steam generators at a rate of 110 gpm each. The water level in the Emergency Feedwater Storage Tank is at 120 inches.**

INITIATING CUE:	**The CRS has directed you to determine how long it will take to empty the Emergency Feedwater Storage Tank.**

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-2 Rev. 1

JPM Title: Time to empty EFWST

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1	Applicant refers to AOP-30, Attachment A "EFWST Emptying Characteristics" or TDB VII EFWST Tank Curve.	Applicant referred to AOP-30, Attachment A and or TDB VII, EFWST Tank Curve. [SAT] [UNSAT]
2	Applicant Determines that the time to empty.	Applicant determined that the time to empty the EFWST is 3.98 hours ± .10 hours. [SAT] [UNSAT]

Termination Criteria: **The time to empty the EFWST has been determined.**

NAME: ______________________

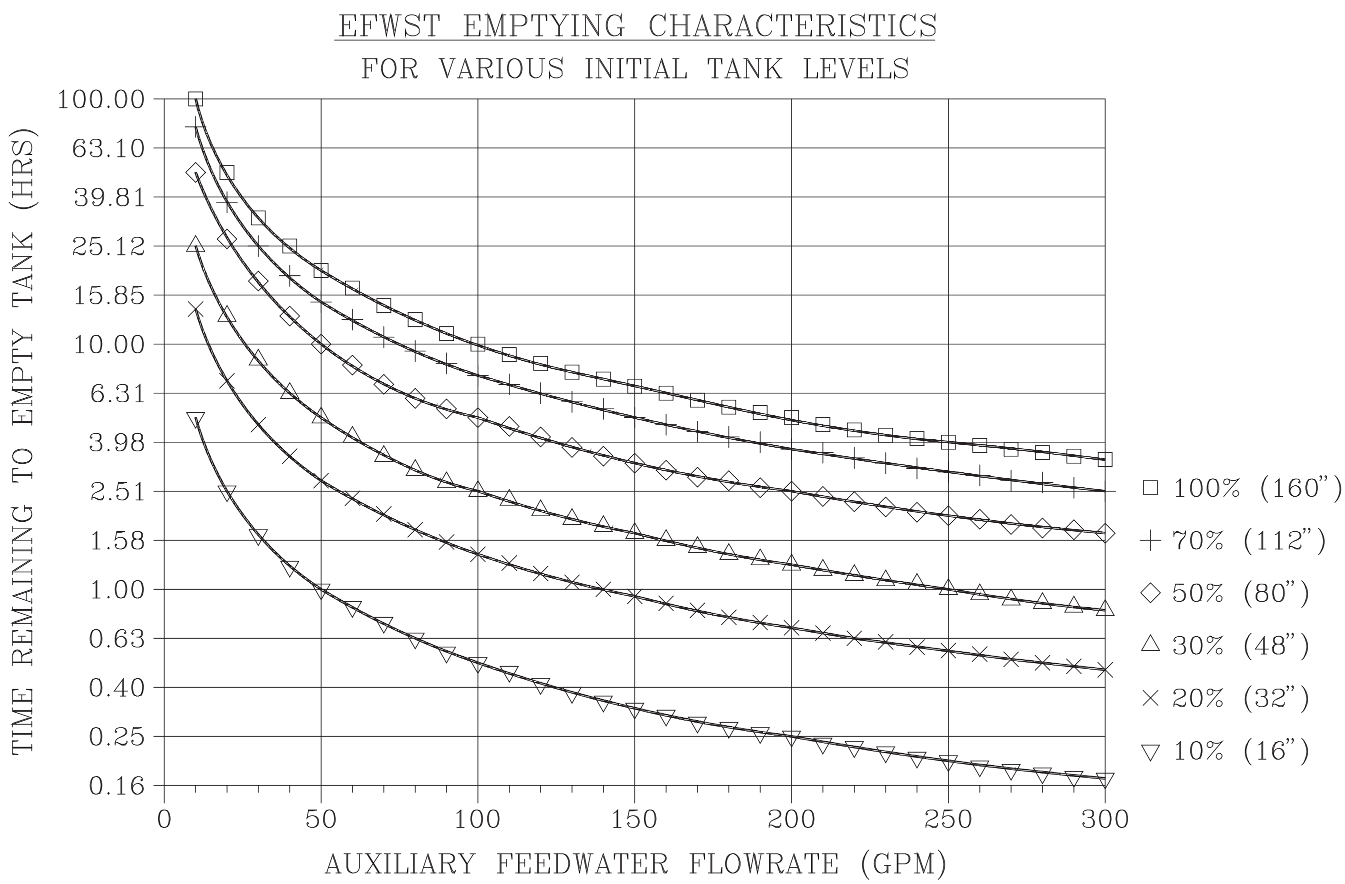
Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS:	**A loss of feedwater has occurred. FW-6 is being used to provide auxiliary feedwater to the steam generators at a rate of 110 gpm each. The water level in the Emergency Feedwater Storage Tank is 120 inches.**
INITIATING CUE:	**The CRS has directed you the BOPO to determine how long it will take to empty the Emergency Feedwater Storage Tank.**

Time to Empty: __________________

Attachment A

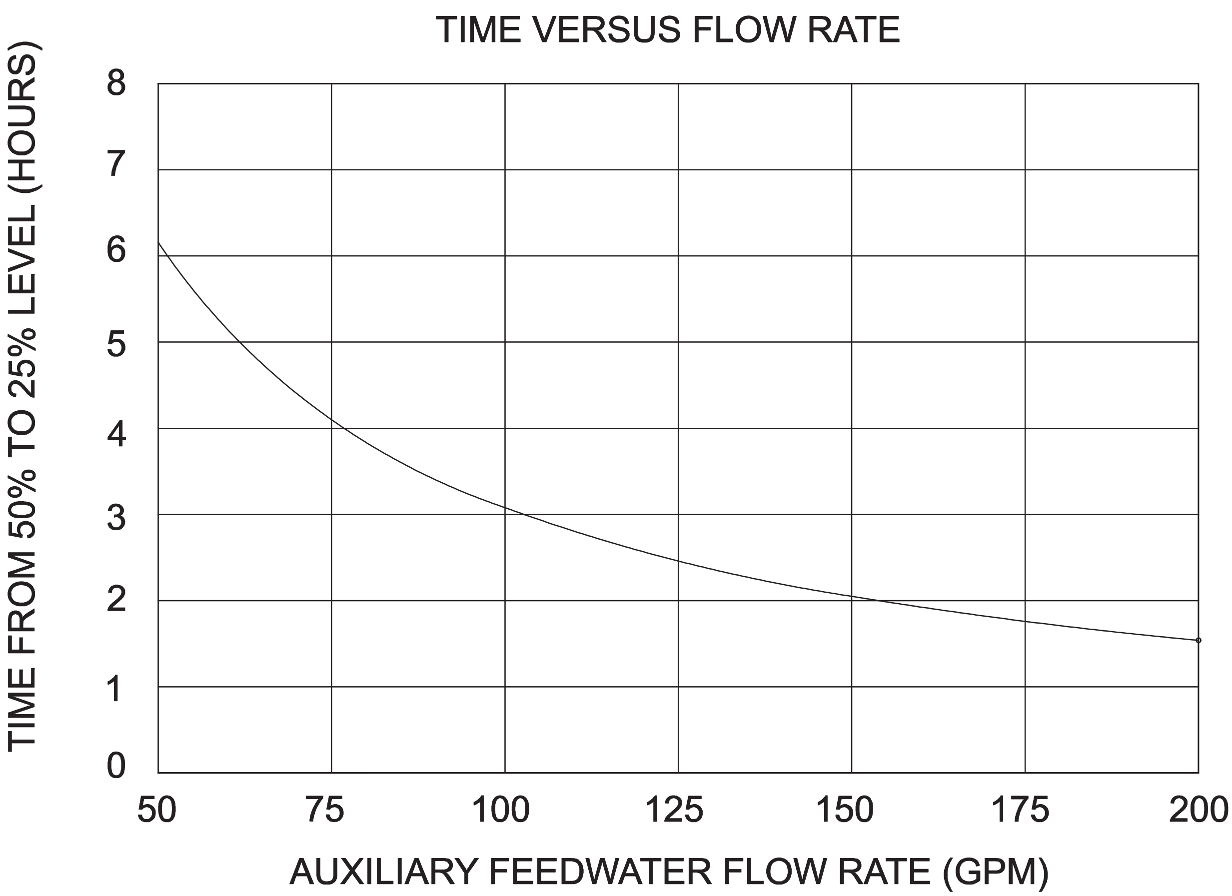
EFWST Emptying Characteristics



End of Attachment A

Attachment B

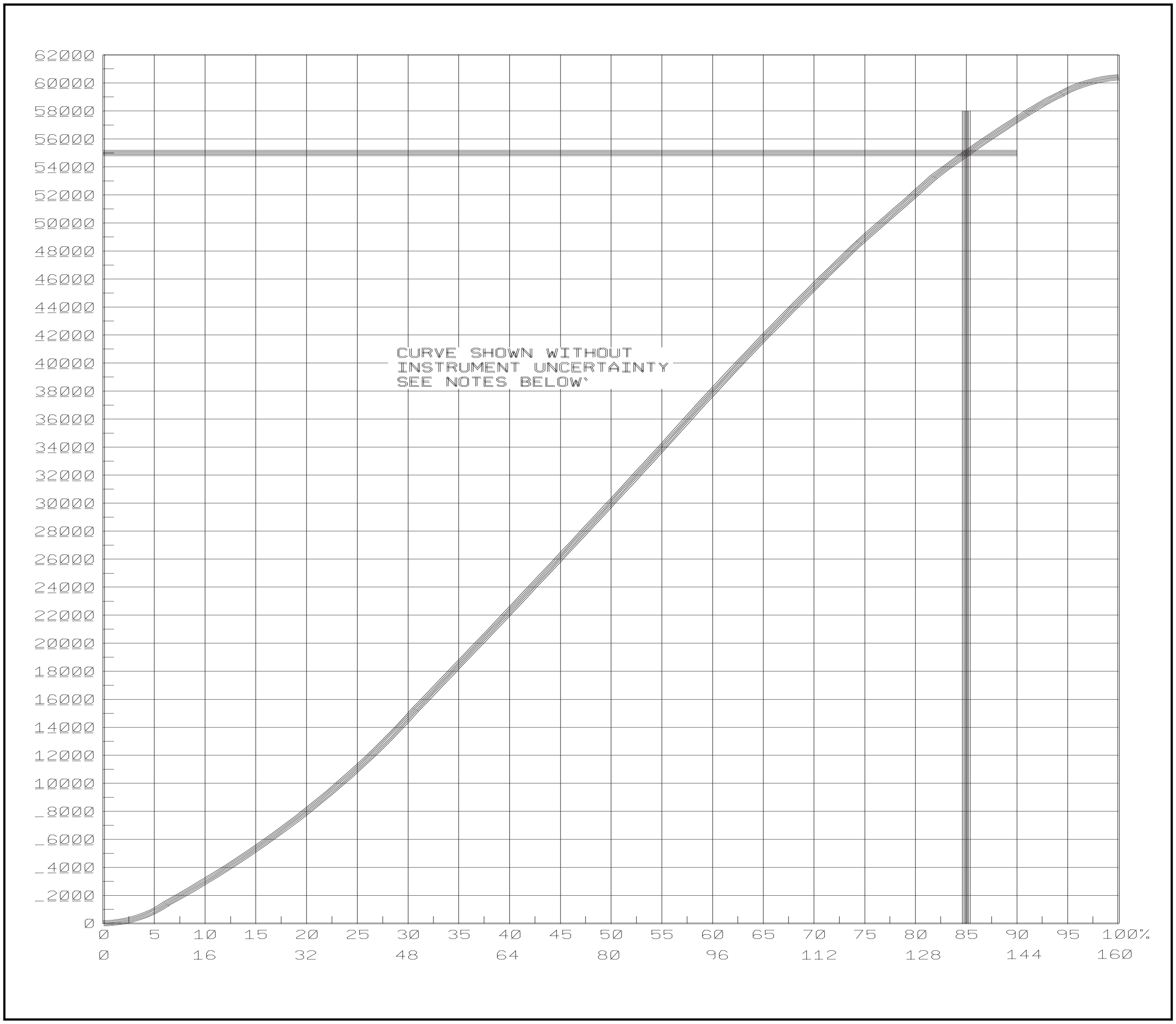
EFWST Time Available Between 50% and 25%



End of Attachment B

Emergency Feedwater Storage Tank, FW-19

NOTES:



1. The RCS shall not be heated above 300°F without a minimum of 55,000 gal. (137 in. on the local sight glass) in the EFWST per T.S. 2.5(3). With instrument uncertainty for LIA-1183 and LIA-1188, this shall be considered 88%. Desired level is greater than 91%.
2. Tank curve is based on optimal calibration of LIA-1183 and LIA-1188.
3. The zero level indication (percent and inches) is taken to be the bottom of the tank. The percent level corresponds to the instrument reading in the Control Room.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-3 Rev. 1

JPM Title: Boration paths with equipment out of service

Location: Classroom

Approximate Time: 20 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A 2.2.15 (RO Imp: 3.9)
Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.
SO-O-21
TDB-VI
One line electrical drawing
TS section 2.2

Handout(s):

Task List #: 0119

Applicable Position(s): RO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ____________

JPM Reviewed by: ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-3 Rev. 1

JPM Title: Boration paths with equipment out of 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: None

Safety Considerations: None

Comments: SO's, TDB, TS, and plant drawings

JPM No: A-3 Rev. 1

JPM Title: Boration paths with equipment out of service

TASK STANDARD:	**Boration paths have been identified.**

INITIAL CONDITIONS:	**The plant is in SO-O-21, Shutdown Condition 1, "Refueling Cavity Water Level Greater than or Equal to 23 feet above the top of the core with UGS removed"** **CH-11A and CH-11B levels are both 30% with a boron concentration of 3.5 WT % Boric Acid. The SIRWT level is 42" with a boron concentration of 2150 ppm. Charging pump CH-1C has been tagged out of service.** **480 volt buses 1B3A and 1B3A-4A will be deenergized to allow work to be performed on BT-1B3A.**

INITIATING CUE:	**You have been requested to determine if 2 independent boration paths will be available once the buses are deenergized. If so, identify:** **(1) the borated water source(s) and** **(2) pump(s) for each boration path.**

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-3 Rev. 1

JPM Title: Boration paths with equipment out of service

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Determine equipment that will be affected by deenergizing the busses.	**NOTE to Evaluator;** Steps 1-3 may be performed in any order: Applicant referred to plant one line electrical drawing (or other suitable plant reference) and determined that there will be no power to CH-1A, SI-2A and SI-2C. [SAT] [UNSAT]
2.	Determine BAST suitability as a boric acid source.	Applicant referred to TDB-VI (COLR) figure 9 and determines that with 2150 PPM in the SIRWT and BAST boron at 3.5%, BAST level must be greater than 32%. With a level of 30% in each BAST neither BAST can be a source by itself, but together they can count as one source. [SAT] [UNSAT]
3.	Determine SIRWT suitability as a boric acid source.	Determine that the SIRWT cannot be used as a source with the charging pumps because the level is less that 80" but that it can be used as a source for the HPSI pump. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
4.	Determines if two independent boration paths are available with the buses deenergized and identifies them.	Applicant determined that 2 independent boration paths are available: 1. CH-11A AND CH-11B (source) through (pump) CH-1B or CH-1C 2. SIRWT (Source) through pump SI-2B [SAT] [UNSAT]

Termination Criteria: Boration paths have been identified.

NAME: ______________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS:

The plant is in SO-O-21, Shutdown Condition 1, "Refueling Cavity Water Level Greater than or Equal to 23 feet above the top of the core with UGS removed"

CH-11A and CH-11B levels are both 30% with a boron concentration of 3.5 WT % Boric Acid. The SIRWT level is 42" with a boron concentration of 2150 ppm. Charging pump CH-1C has been tagged out of service.

480 volt buses 1B3A and 1B3A-4A will be deenergized to allow work to be performed on BT-1B3A.

INITIATING CUE:

You have been requested to determine if 2 independent boration paths will be available once the buses are deenergized. If so, identify:

ANSWERS:

(1) the borated water source(s) and

(2) pump for each boration path.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System
2.2.1 Boric Acid Flow Paths - Shutdown

Applicability

Applies to the operational status of the boric acid flow paths in MODES 4 and 5 when fuel is in the reactor.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

As a minimum, one of the following boric acid flow paths from an OPERABLE borated water source shall be OPERABLE:

a. A flow path from boric acid storage tank CH-11A via either a boric acid transfer pump or a gravity feed connection and a charging pump to the Reactor Coolant System.

b. A flow path from boric acid storage tank CH-11B via either a boric acid transfer pump or a gravity feed connection and a charging pump to the Reactor Coolant System.

c. A flow path from both boric acid storage tanks (CH-11A and CH-11B) via either a boric acid transfer pump or gravity feed connection and a charging pump to the Reactor Coolant System.

d. A flow path from the SIRW tank via either a charging pump or a high pressure safety injection pump to the Reactor Coolant System.

Required Actions

(1) With none of the above boric acid flow paths OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.2 Chemical and Volume Control System (Continued)
2.2.2 Boric Acid Flow Paths - Operating

Applicability

Applies to the operational status of the boric acid flow paths whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

At least two of the following boric acid flow paths from OPERABLE borated water sources shall be OPERABLE:

a. A flow path from boric acid storage tank CH-11A, via either a boric acid transfer pump or a gravity feed connection and a charging pump to the Reactor Coolant System.

b. A flow path from boric acid storage tank CH-11B, via either a boric acid transfer pump or a gravity feed connection and a charging pump to the Reactor Coolant System.

c. A flow path from both boric acid storage tanks (CH-11A and CH-11B) via either a boric acid transfer pump or gravity feed connection and a charging pump to the Reactor Coolant System.

d. A flow path from the SIRW tank via a charging pump to the Reactor Coolant System.

Required Actions

(1) With only one of the above required boric acid flow paths to the Reactor Coolant System OPERABLE, restore to at least two OPERABLE boric acid flow paths to the Reactor Coolant System within 72 hours.

(2) With the required actions of (1) not met, or with none of the required boric acid flow paths to the Reactor Coolant System OPERABLE, be in at least HOT SHUTDOWN within 6 hours, in at least subcritical and <300°F within the next 6 hours, and in at least COLD SHUTDOWN within the following 30 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System (Continued)
2.2.3 Charging Pumps - Shutdown

Applicability

Applies to the operational status of charging pumps in MODES 4 and 5 when fuel is in the reactor.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

At least one charging pump or one high pressure safety injection pump in the boric acid flow path required to be OPERABLE pursuant to Specification 2.2.1 shall be OPERABLE.

Required Actions

(1) With no charging pump or high pressure safety injection pump OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

2.0 LIMITING CONDITIONS FOR OPERATION

2.2 Chemical and Volume Control System (Continued)

2.2.4 Charging Pumps - Operating

Applicability

Applies to the operational status of charging pumps whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

At least two charging pumps shall be OPERABLE.

Required Actions

(1) With only one charging pump OPERABLE, restore to at least two OPERABLE charging pumps within 72 hours.

(2) With the required actions of (1) not met, or with no charging pumps OPERABLE, be in at least HOT SHUTDOWN within 6 hours, in at least subcritical and <300°F within the next 6 hours, and in at least COLD SHUTDOWN within the following 30 hours.

2.0 **LIMITING CONDITIONS FOR OPERATION**

2.2 Chemical and Volume Control System (Continued)

2.2.5 Boric Acid Transfer Pumps - Shutdown

Applicability

Applies to the operational status of the boric acid transfer pumps in MODES 4 and 5 when fuel is in the reactor.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

At least one boric acid transfer pump shall be OPERABLE if the flow path through the boric acid transfer pump in Specification 2.2.1 is OPERABLE.

Required Actions

(1) With no boric acid transfer pump OPERABLE as required to complete the flow path of Specification 2.2.1, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System (Continued)
2.2.6 Boric Acid Transfer Pumps - Operating

Applicability

Applies to the operational status of the boric acid transfer pumps whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

At least the boric acid transfer pump(s) in the boric acid flow path(s) required to be OPERABLE pursuant to Specification 2.2.2 shall be OPERABLE if the flow path(s) through the boric acid transfer pump(s) in Specification 2.2.2 is OPERABLE.

Required Actions

(1) With one boric acid transfer pump required to be OPERABLE to complete one of the two boric acid flow paths of Specification 2.2.2 inoperable, restore the boric acid transfer pump to OPERABLE status within 72 hours.

(2) With the required actions of (1) not met, or with two boric acid transfer pumps required to be OPERABLE to complete both of the boric acid flow paths of Specification 2.2.2 inoperable, be in at least HOT SHUTDOWN within 6 hours, in at least subcritical and <300°F within the next 6 hours, and in at least COLD SHUTDOWN within the following 30 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System (Continued)
2.2.7 Borated Water Source - Shutdown

Applicability

Applies to the operational status of borated water sources in MODES 4 and 5 when fuel is in the reactor.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

As a minimum, one of the following borated water sources shall be OPERABLE:

a. Boric acid storage tank CH-11A with the contents of the tank in accordance with the COLR for a SIRW tank boron concentration at REFUELING BORON CONCENTRATION, and with the ambient temperature of the boric acid solution greater than or equal to the solubility temperature of Figure 2-12.

b. Boric acid storage tank CH-11B with the contents of the tank in accordance with the COLR for a SIRW tank boron concentration at REFUELING BORON CONCENTRATION, and with the ambient temperature of the boric acid solution greater than or equal to the solubility temperature of Figure 2-12.

c. Both boric acid storage tanks CH-11A and CH-11B with the combined contents of both tanks in accordance with the COLR for a SIRW tank boron concentration at REFUELING BORON CONCENTRATION, and with the ambient temperature of the boric acid solution greater than or equal to the solubility temperature of Figure 2-12.

d. The SIRW tank with:

    1. A minimum useable borated water volume of 10,000 gallons,

    2. A minimum boron concentration of REFUELING BORON CONCENTRATION, and

    3. A minimum solution temperature of 50°F.

Required Actions

(1) With no borated water source OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System (Continued)
2.2.8 Borated Water Sources - Operating

Applicability

Applies to the operational status of borated water sources whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F.

Objective

To assure operability of equipment required to add negative reactivity.

Specification

Both of the following borated water sources shall be OPERABLE:

a. At least one boric acid storage tank (CH-11A or CH-11B) with the contents of the tank in accordance with the COLR, or both boric acid storage tanks (CH-11A and CH-11B) with the combined contents of both tanks in accordance with the COLR, and with the ambient temperature of the boric acid solution greater than or equal to the solubility temperature of Figure 2-12.

b. The SIRW tank with:

    1. A minimum useable borated water volume of 25,000 gallons,

    2. A minimum boron concentration of REFUELING BORON CONCENTRATION, and

    3. A minimum solution temperature of 50°F.

Required Actions

(1) With the above required boric acid storage tank(s) inoperable, restore the tank(s) to OPERABLE status within 72 hours.

(2) With the SIRW tank inoperable, be in at least HOT SHUTDOWN within 6 hours, in at least subcritical and <300°F within the next 6 hours, and in at least COLD SHUTDOWN within the following 30 hours.

(3) With the required actions of (1) not met, or with no OPERABLE borated water source, be in at least HOT SHUTDOWN within 6 hours, in at least subcritical and <300°F within the next 6 hours, and in at least COLD SHUTDOWN within the following 30 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System (Continued)

Basis

The chemical and volume control system provides control of the reactor coolant system boron inventory.[1] This is normally accomplished by using any one of the three charging pumps in series with one of the two boric acid pumps, or taking suction from one or both of the gravity feed valves. An alternate method of boration is to use the charging pumps directly from the SIRW tank. A third method is to depressurize and use the safety injection pumps.

The chemical and volume control system (CVCS) operates in conjunction with the safety injection system to inject concentrated boric acid into the reactor coolant system on receipt of a pressurizer pressure low signal (PPLS) and/or a containment pressure high signal (CPHS). Because this system is not necessary to mitigate the consequences of accidents, as documented in USAR Chapter 14, this system, including charging pumps, is not classified as Engineered Safeguards equipment.[2]

Operability requirements for the CVCS borated water sources, boric acid flow paths, boric acid transfer pumps, and charging pumps ensure that an adequate source of boric acid is available to provide required shutdown margin during a plant cooldown and applicable plant modes. Operator actions have been identified to ensure the ability of the CVCS system to perform its function in the event of an equipment failure.

Borated water sources

The sources of borated water available are: (1) boric acid storage tank CH-11A, boric acid storage tank CH-11B, or the combination of boric acid storage tanks CH-11A and CH-11B; and (2) the SIRW tank. These sources have sufficient boron to maintain required shutdown margin during a plant cooldown.

Whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F, two borated water sources must be operable in order to ensure sufficient capacity. For a borated water source to be considered operable, tank volume, boron concentration, and temperature of the contained boric acid solution must be within their respective requirements.

In Modes 4 and 5 when fuel is in the reactor, only one of these sources must be operable. One source is acceptable during these modes on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting core alterations and positive reactivity changes in the event the single source becomes inoperable. If no sources are operable, restore at least one source to operable status.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.2 Chemical and Volume Control System (Continued)

Basis (Continued)

Boric acid flow paths

Consistent with the requirement to maintain two borated water sources operable when the RCS temperature is greater than or equal to 210°F, a minimum of two boric acid flow paths from operable borated water sources must also be operable. For a flow path to be considered operable, boric acid must be capable of being transported from the operable borated water source to the reactor coolant system. Consistent with the requirements for borated water sources, 72 hours is allowed to restore the system to two operable flow paths.

The flow paths available depend on which sources of borated water are operable. A flow path from a boric acid storage tank may be through the gravity feed connection or a boric acid transfer pump. When one of the operable sources is the combined contents of both boric acid storage tanks, then the flow path from this source requires that a flow path from each tank to the RCS be operable. This flow path can be established by using various combinations of gravity feed connections and/or boric acid transfer pumps. Both tanks could also be aligned to a single boric acid transfer pump since the specification requires, when using this flow path, that a flow path from the SIRW tank be operable. Therefore, two flow paths are available by maintaining the additional flow path from the SIRW tank.

In Modes 4 and 5 when fuel is in the reactor, only one flow path must be operable. One flow path is acceptable during these modes on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting core alterations and positive reactivity changes in the event the single flow path becomes inoperable. If no flow path is operable, restore at least one flow path to operable status.

Boric Acid Transfer Pumps

Boric acid transfer pumps need only be operable if required to complete an operable boric acid flow path.

Whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F, two flow paths from operable borated water sources are required to be operable. The flow path from an operable boric acid storage tank may be through the gravity feed connection or a boric acid transfer pump. If the gravity feed connection from the operable boric acid storage tank is inoperable, then a boric acid transfer pump must be operable in order to complete an operable flow path. The specification allows 72 hours to restore one boric acid transfer pump if it is required to complete a flow path. In this situation, the one inoperable pump renders one required flow path inoperable. The specification requires a plant shutdown if two boric acid transfer pumps are inoperable that are required to complete two flow paths. In this situation, the inoperable pumps render both required flow paths inoperable.

2.0 LIMITING CONDITIONS FOR OPERATION
2.2 Chemical and Volume Control System (Continued)

Basis (Continued)

In Modes 4 and 5 when fuel is in the reactor, only one flow path must be operable. This is consistent with the number of operable borated water sources required during these modes. If the gravity feed connection from the operable boric acid storage tank is inoperable, then a boric acid transfer pump must be operable in order to complete an operable flow path.

Boric acid transfer pumps are each of sufficient capacity to feed all three charging pumps at their maximum capacity.

Charging Pumps

Whenever the reactor coolant temperature (T_{cold}) is greater than or equal to 210°F, two charging pumps must be operable in order to ensure it is possible to inject concentrated boric acid into the reactor coolant system. With only one pump operable, 72 hours is allowed to restore the system to two operable charging pumps. This is consistent with the allowed outage time for the borated water sources and flow paths required during these modes.

In Modes 4 and 5 when fuel is in the reactor, only one charging pump or high pressure safety injection pump must be operable. This is consistent with the number of operable borated water sources and flow paths required during these modes. A pump is required in order to complete an operable flow path to the reactor coolant system. There are additional restrictions on the use of high pressure safety injection pumps contained in Technical Specification 2.3 to ensure that the reactor vessel is not overpressurized.

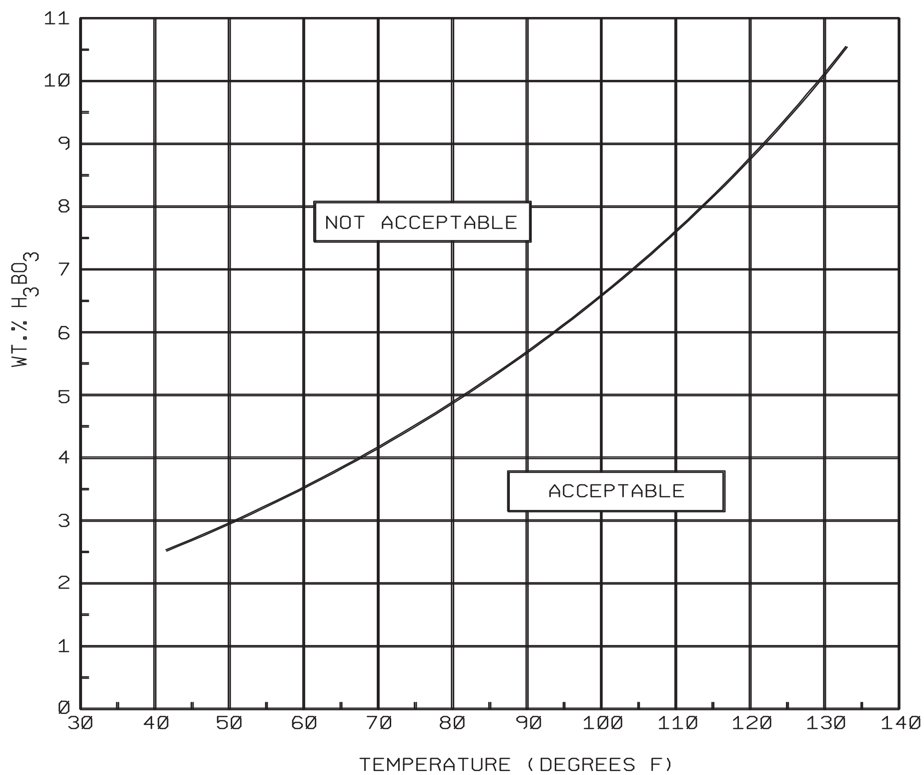
Figure 2-12 contains a 10°F bias to account for temperature measurement uncertainty. An administrative procedure to monitor the temperature of the BASTs and boric acid system piping in the Auxiliary Building ensures that the temperature requirements of Figure 2-12 are met. Should the system temperature be unacceptable for operation at the current boric acid concentration, steps will be taken to reduce the boric acid concentration or raise the temperature of the system such that the concentration is within the acceptable range of Figure 2-12.

The limits on component operability and the time periods for inoperability were selected on the basis of the redundancy indicated above and NUREG-0212 Revision 2. The allowed outage times for the various components are consistent such that a support system has the same allowed outage time as the supported system.

References

(1) USAR Section 9.2
(2) USAR Section 6.1.2.1

Figure 2-12



BORIC ACID SOLUBILITY IN WATER	OMAHA PUBLIC POWER DISTRICT FORT CALHOUN STATION-UNIT 1	FIGURE 2-12

Attachment 1 – Shutdown Condition 1
Refueling Cavity Water Level Greater Than Or Equal To 23 Feet Above The Top Of The Core

Key Safety Function (Available unless otherwise specified)	Minimum Required	Options (Circle available/operable trains and place check mark next to each operating train.)						Initial
Heat Removal								
SDC (1 OPERABLE Loop and in operation) T.S. 2.8.1(3)	1	SI-1A	SI-1B	SI-3A	SI-3B	SI-3C	T.S. 2.8.1(3)2	
	1	AC-4A	AC-4B					
SFP Cooling Pumps (1 in operation)	2	AC-5A	AC-5B					
CCW Pumps (1 in operation)	2	AC-3A	AC-3B	AC-3C				
RW Pumps (1 in operation)	2	AC-10A	AC-10B	AC-10C	AC-10D			
Spent Fuel Pool Temperature (Record value)	45-100°F							
Inventory Control (Makeup flow paths, Form FC-1291)								
CS Pump (with flow path)	1	SI-3A	SI-3B	SI-3C				
HPSI and Charging Pumps (with flow paths)	1 HPSI or 2 Charging	SI-2A	SI-2B	SI-2C	CH-1A	CH-1B	CH-1C	
Suction Path from Containment	1	HCV-383-3	HCV-383-4					
Containment Sump Level Instruments	1	LI-387	LI-387-1	LI-388	LI-388-1			
RCS Level Instruments	2	LRC-101X	LRC-101Y	LI-106	LI-199			
Spent Fuel Pool Makeup Source	1	FP-1B	Ability to cross-tie Blair water to FP (OI-FP-1 Att. 36)					
Spent Fuel Pool Makeup Flow Path	1	Flow path to fire cabinet in Room 69 and sufficient hose to reach SFP						
Power System Availability								
Offsite Power	1	345 KV	161 KV					
Diesel Generators	1	DG-1	DG-2					
Vital 4160V Buses	1	1A3	1A4					
DC Bus with Battery	1	DC Bus #1 & EE-8A	DC Bus #2 & EE-8B					
Vital AC Instrument Buses	2	AI-40A	AI-40B	AI-40C	AI-40D			
Non-vital AC Instrument Bus	2	AI-42A	AI-42B					
SDC Control Power	2	Inverter No. 2 (EE-8Q) powered from battery				Inverter No. 2 Bypass Transformer (MCC-4A1)		
Instrument Air System Availability								
Air Compressors (1 in operation)	2	CA-1A	CA-1B	CA-1C				
Air Compressor Cooling	1	AC-9A	AC-9B	Potable water to in service air compressor				
Reactivity Control (Boric Acid flow paths, Form FC-1290)								
Borated Water Source (OPERABLE) T.S. 2.2.7	1	CH-11A (TDB-VI)	CH-11B (TDB-VI)	CH-11A + CH-11B (TDB-VI)	SIRWT >34" (1 HPSI)	>42" (2 HPSI)	>92" (Charging)	
Charging Pumps (1 OPERABLE) T.S. 2.2.3	2	CH-1A	CH-1B	CH-1C	SI-2A	SI-2B	SI-2C	
Boric Acid Transfer Pumps (OPERABLE)	If credited in T.S. 2.2.5	CH-4A	CH-4B					
Boric Acid Flow Path (1 OPERABLE) T.S. 2.2.1	2	CH-11A	CH-11B	CH-11A + CH-11B	SIRWT (1 HPSI)	SIRWT (2 HPSI)	SIRWT (Charging)	
Wide Range NI (OPERABLE) T.S. 2.8.1(2)	2	AI-31A	AI-31B	AI-31C	AI-31D			

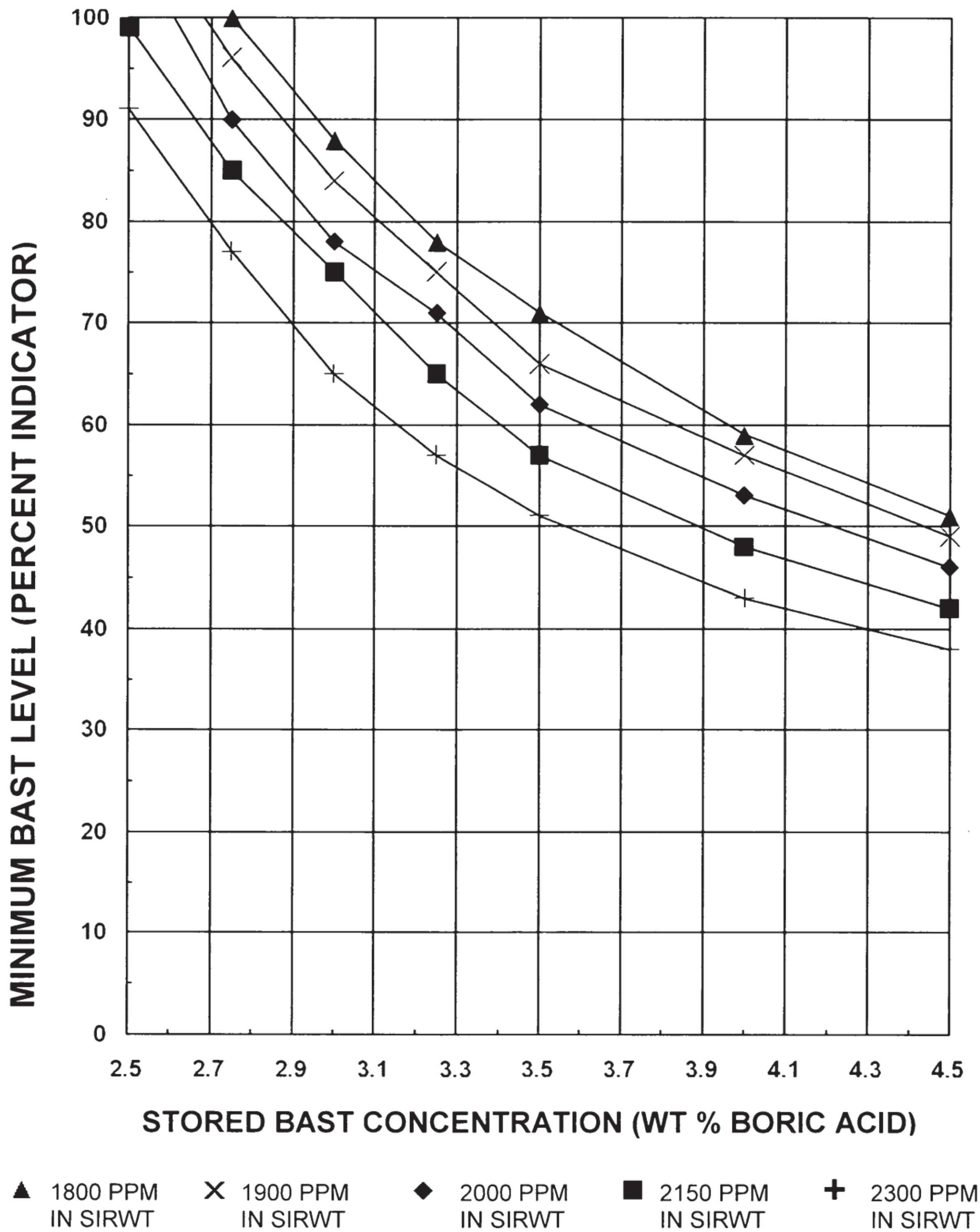
Attachment 1 – Shutdown Condition 1
Refueling Cavity Water Level Greater Than Or Equal To 23 Feet Above The Top Of The Core

Key Safety Function (Available unless otherwise specified)	Minimum Required	Options (Circle available/operable trains and place check mark next to each operating train.)						Initial
Containment								
Containment Fan with Cooling Water	1	VA-3A	VA-3B	VA-7C	VA-7D			
Radiation Monitor (OPERABLE when required per T.S. 2.8.2(3))	1	RM-051	RM-052	RM-062				
CRHS/VIAS Channels (OPERABLE when required per T.S. 2.8.2(3))	1	86A/CRHS 86A/VIAS	86B/CRHS 86B/VIAS					
VIAS Manual Actuation (OPERABLE when required per T.S. 2.8.2(3))	1	86A/CRHS Test Switch	86B/CRHS Test Switch	No Refueling In Progress				

Comments (List key aspects of any contingencies in place to support maintaining a key safety function)

Performed by SSA:____ Date/Time: _______/_____

Approved by SM: ____ Date/Time: _______/_____



COLR	MINIMUM BAST LEVEL vs. STORED BAST CONCENTRATION	FIGURE 9

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-4 Rev. 0

JPM Title: Read a Survey Map and apply RWP Requirements

Location: Classroom

Approximate Time: 7 minutes

Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): K/A 000000 2.3.7 (RO Imp: 3.5)
Room 22 Survey Map
RWP 14-0002

Handout(s): Room 22 Survey Map
RWP 14-0002

Task List #: 0062

Applicable Position(s): RO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: __________

JPM Reviewed by: ______________________________ Date: __________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-4 Rev. 0

JPM Title: Read a Survey Map and apply RWP Requirements

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: RWP 14-0002 and Rm 22 Survey Map

Safety Considerations: None

Comments: None

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-4 Rev. 0

JPM Title: Read a Survey Map and apply RWP Requirements

TASK STANDARD:	**Read Survey Map and applied RWP requirements in that the Low Dose waiting area was identified, the highest radiation level at 30cm was identified and single PC dress out for entering CA is necessary.**

INITIAL CONDITIONS:	**The plant is in Mode 1. The previous shift's EONA noticed a small leak coming from the discharge flange of SI-1B. The previous EONA placed a catch basin under the leak.**

INITIATING CUE:	**You are the EONA and have been directed to establish a clearance on SI-1B, mechanically isolating it from the system. Vent and draining the pump will be required.** **Using the provided Survey Map and RWP, determine the low dose waiting area, the highest radiation level at 30cm and any RWP requirements that need to be applied.**

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-4 Rev. 0

JPM Title: Read a Survey Map and apply RWP Requirements

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Review the Survey Map for responses to Initial Condition and Initiating Cue.	Applicant determined the Low Dose Waiting Area is in the SW corner of the room (<.5 mrem), Applicant determined the highest dose at 30cm is +20 for HS#69 and HS#70. Applicant determined that mechanically isolating SI-1B and establishing a clearance would require entry into a CA or reach across a boundary. [SAT] [UNSAT]
2.	Review the RWP to apply requirements/work instructions.	Applicant determined the RWP EAD Dose and Rate are adequate for the task. Applicant determined Protective Clothing Requirements. Single PC dress is required inside CA. RP may authorize lab coats for work which has minimal risk of whole body contamination. Applicant may also include Contact RP for requirements for reaching across radiological boundaries [SAT] [UNSAT]

STEP	ELEMENT	STANDARD

Termination Criteria: **Read Survey Map and applied RWP requirements in that the Low Dose waiting area was identified, the highest radiation level at 30cm was identified and single PC dress out for entering CA is necessary.**

NAME: ______________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS: The plant is in Mode 1. The previous shift's EONA noticed a small leak coming from the discharge flange of SI-1B. The previous EONA placed a catch basin under the leak.

INITIATING CUE: You are the EONA and have been directed to establish a clearance on SI-1B, mechanically isolating it from the system. Vent and draining the pump will be required.

Using the provided Survey Map and RWP, determine the low dose waiting area, the highest radiation level at 30cm and any RWP requirements that need to be applied.

ANSWER:

OPPD
Fort Calhoun Station

RADIATION WORK PERMIT

14-0002 Rev 0

RWP Start: January 1, 2014 0:00 | RWP Expiration: December 31, 2014 23:59

Job Location: AUX/RW - ALL LOC.

RWP Type: GENERAL

Job Description: Routine Operation duties

Tasks

Task 1 - Shift Aux Bldg Operator
RP Coverage: CONTINUOUS/INTERMITT — EAD: Dose=40 mrem, Rate=400 mrem/hr; Budget=640 mrem
Protective Clothing: SEE WORKER INSTRUCTIONS
Respiratory Protection: Conditional: FFM/PAPR
Allowed Posting: RA, HRA, RHRA, CA, HCA, ARA

Task 2 - Aux Bldg Support
RP Coverage: CONTINUOUS/INTERMITT — EAD: Dose=40 mrem, Rate=400 mrem/hr; Budget=103 mrem
Protective Clothing: SEE WORKER INSTRUCTIONS
Respiratory Protection: Conditional: FFM/PAPR
Allowed Posting: RA, HRA, RHRA, CA, HCA, ARA

Task 3 - Ops Training Activities
RP Coverage: CONTINUOUS/INTERMITT — EAD: Dose=10 mrem, Rate=80 mrem/hr; Budget=28 mrem
Protective Clothing: SEE WORKER INSTRUCTIONS
Respiratory Protection: Prohibited
Allowed Posting: RA, HRA, RHRA, CA, HCA, ARA

Task 4 - Supervisory Tours
RP Coverage: CONTINUOUS/INTERMITT — EAD: Dose=10 mrem, Rate=80 mrem/hr; Budget=5 mrem
Protective Clothing: SEE WORKER INSTRUCTIONS
Respiratory Protection: Prohibited
Allowed Posting: RA, HRA, CA, HCA, ARA

Worker Instructions

-TLD & EAD required for entry into the Radiological Control Area (RCA)
-Entries into a RHRA or HRA require a specific RP briefing.
-A High Noise EAD is required for work in a posted Hearing Protection Required area within an HRA unless continuous RP coverage or Teledosimetry is provided.
-Unless otherwise stated, the Stop Work dose rate shall be the EAD dose rate alarm set point for the task.
-Workers shall utilize low dose areas as applicable to minimize exposure.
-Contact Contamination Control (Decon) for work area setup (e.g. drip catches, HEPA ventilation equipment/vacuums in advance of work.
-HEPA ventilation or vacuum required for contaminated system breach as directed by RP.
-Workers shall conduct work IAW SO-G-101 (Radiation Worker Practices).
-Workers shall review the electronic survey maps for work area conditions.
-Contact RP prior to entering a posted Alpha II or Alpha III area, work in these areas requires additional controls.
-Contact RP for requirements prior to reaching across radiological boundaries.

(Protective Clothing Requirements)
Contaminated Area (CA) = Single PC dress.
RP may authorize the use of lab coats for work which has minimal risk of whole body contamination.
High Contamination Area (HCA) = Double PC dress
RP may authorize the use of double gloves and shoe covers for work in an HCA deemed to be a moderate risk for whole body contamination.

NOTE: Deviation from RWP requirements requires RP Supervisor approval.

OPPD Fort Calhoun Station	RADIATION WORK PERMIT	14-0002 Rev 0

Task-Specific Instructions

Task ______________________

RP Instructions

Task ______________________
-

Approvals

RP TECHNICIAN	Date 1/8/14
SUPERVISOR-RAD OPERATIONS	Date 1/8/14
SUPERVISOR-ALARA	Date 1-8-14
MANAGER-RAD PROTECTION	Date 1-9-14

Fort Calhoun Station Radiation Protection Form
Survey M-20140117-4

General Information

Title: Room 22

Survey Date/Time: 1/17/2014 11:30 — Lead Surveyor: [redacted]

Survey Type: Monthly — Work Order/Task #:

Counted By: Surveyor 1/24/2014 14:29 — Rx % Pwr: 100%

RWP Number: 14-0001

Status: Ready for Review by: [redacted] 1/24/2014 14:52:02

Dose Rate (DR) Object Prefixes/Suffixes

Dose Rates with Prefixes:	Dose Rates with No Prefixes:	Default Prefixes:	Default Suffixes
# = Hot Spot	General	HS = Hot Spot	"n" = Neutron
* = Contact			"b" = Beta
+ = 30cm			"c" = Corrected

Postings Legend

BelowGrate=Below Grating
CA=Contaminated Area
CRP=Contact RP Prior to Entry
HCA=Highly Contaminated Area
In Taped=Inside Taped Area
RA=Radiation Area

Map Location

File Name	Image Description	Location Code	Bldg/Area Name	Location Description
Aux 989\FC-RP-202-68	Room 22	Aux 989 (Corridor 4)	Room 22	Roon 22, SI Pump Room

Instruments Used

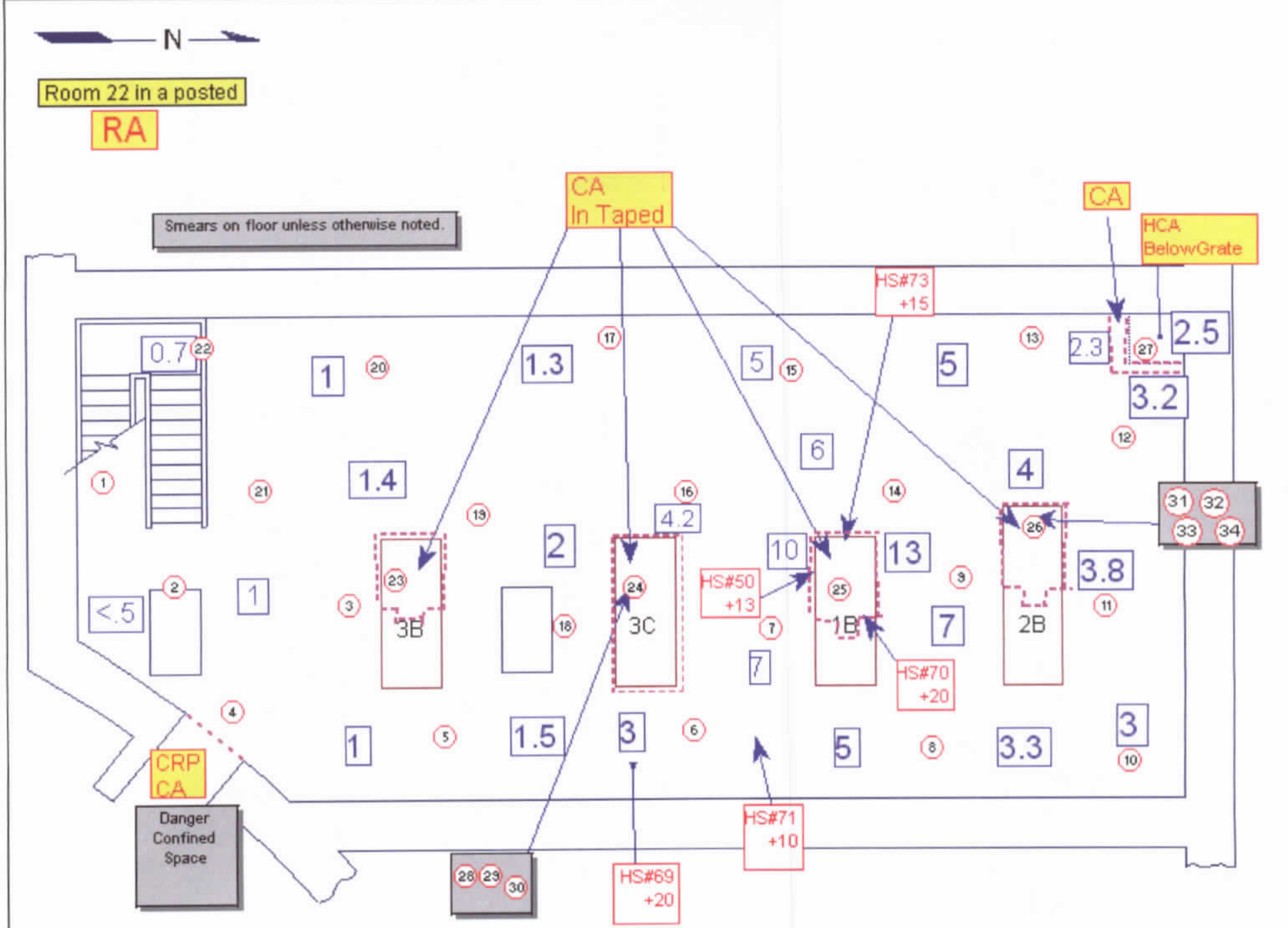
#	Instrument Model	Instrument Serial #	Inst Type	Probe Model	Probe Type	Calibration Date/Time
1	RO-20	2720	D	NONE	D	3/25/2014
2	WPC-9550	2	C	NONE	C	4/15/2014

Instruments Used - Notes

#	Notes
1	date is cal. due
2	date is cal. due

Fort Calhoun Station Radiation Protection Form

Room 22	Survey #: M-20140117-4	Date/Time: 1/17/2014 11:30



Comments: Peer checked by [redacted]

Type: Monthly

Symbol Legend (for example only)

*100 ← Contact Reading
+30 ← 30 cm Reading
5 ← General Area
Radiological Boundary
1 Smear
1 Air Sample
1 Direct Frisk
LAS/Wipe

RWP #: 14-0001
Reactor Power = 100%

Lead Surveyor: [redacted]	Status: Ready for Review by: [redacted] 1/24/2014 14:52:02
Location Code: Aux 989 (Corridor 4)	Bldg/Area Name: Room 22
Location Description: Roon 22, SI Pump Room (East)	

Data Point Details

Survey #: M-20140117-4

Map: Room 22

#	Type	Inst.	Value	Units	Position	Notes
DR	γ	N/A	3.2	mrem/hr		
DR	γ	N/A	2.5	mrem/hr		
DR	γ	N/A	2	mrem/hr		
DR	γ	N/A	4.2	mrem/hr		
DR	γ	N/A	5	mrem/hr		
DR	γ	N/A	1.4	mrem/hr		
DR	γ	N/A	0.7	mrem/hr		
DR	γ	N/A	<.5	mrem/hr		
DR	γ	N/A	1.3	mrem/hr		
DR	γ	N/A	5	mrem/hr		
DR	γ	N/A	3.8	mrem/hr		
DR	γ	N/A	3.3	mrem/hr		
DR	γ	N/A	5	mrem/hr		
DR	γ	N/A	1	mrem/hr		
DR	γ	N/A	13	mrem/hr		
DR	γ	N/A	1	mrem/hr		
DR	γ	N/A	1	mrem/hr		
DR	γ	N/A	2.3	mrem/hr		
DR	γ	N/A	3	mrem/hr		
DR	γ	N/A	1.5	mrem/hr		
DR	γ	N/A	3	mrem/hr		
DR	γ HS	N/A N/A	HS # 69 + 20	mrem/hr mrem/hr	H/S 69 in Overhead	
DR	γ HS	N/A N/A	HS # 50 + 13	mrem/hr mrem/hr	H/S 50	
DR	γ HS	N/A N/A	HS # 70 + 20	mrem/hr mrem/hr	Under LPSI shaft shroud	
DR	γ	N/A	4	mrem/hr		
DR	γ	N/A	6	mrem/hr		
DR	γ	N/A	7	mrem/hr		
DR	γ	N/A	7	mrem/hr		
DR	γ	N/A	10	mrem/hr		
DR	γ HS	N/A N/A	HS # 71 + 10	mrem/hr mrem/hr	8' in overhead	
DR	γ HS	N/A N/A	HS # 73 + 15	mrem/hr mrem/hr	drain under pump	
1	Smear	N/A N/A	β 37 α <17	DPM/100 cm2 DPM/100 cm2		
2	Smear	N/A N/A	β <31 α <17	DPM/100 cm2 DPM/100 cm2	on column	
3	Smear	N/A N/A	β <31 α <17	DPM/100 cm2 DPM/100 cm2		
4	Smear	N/A N/A	β <31 α <17	DPM/100 cm2 DPM/100 cm2		
5	Smear	N/A N/A	β <31 α <17	DPM/100 cm2 DPM/100 cm2		
6	Smear	N/A N/A	β <31 α <17	DPM/100 cm2 DPM/100 cm2		
7	Smear	N/A N/A	β 74 α <17	DPM/100 cm2 DPM/100 cm2		

Fort Calhoun Station Radiation Protection Form

Data Point Details

Survey #: M-20140117-4

Map: Room 22

#	Type	Inst.	Value	Units	Position	Notes
8	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
9	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
10	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
11	Smear	N/A	β 31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
12	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
13	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
14	Smear	N/A	β 59	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
15	Smear	N/A	β 43	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
16	Smear	N/A	β 40	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
17	Smear	N/A	β <31	DPM/100 cm2	vent duct	
		N/A	α <17	DPM/100 cm2		
18	Smear	N/A	β 56	DPM/100 cm2	ladder	
		N/A	α <17	DPM/100 cm2		
19	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
20	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
21	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
22	Smear	N/A	β <31	DPM/100 cm2		
		N/A	α <17	DPM/100 cm2		
23	Smear	N/A	β 1213	DPM/100 cm2	pump base	
		N/A	α <17	DPM/100 cm2		
24	Smear	N/A	β 11012	DPM/100 cm2	pump base	deconned and resmeared #'s 28 - 30
		N/A	α 38	DPM/100 cm2		
		N/A	β:α 289	:1 Beta/Alpha Ratio		
25	Smear	N/A	β 11779	DPM/100 cm2	pump base	
		N/A	α <17	DPM/100 cm2		
26	Smear	N/A	β 23540	DPM/100 cm2	pump base	
		N/A	α 71	DPM/100 cm2		
		N/A	β:α 331	:1 Beta/Alpha Ratio		
27	Smear	N/A	β 659	DPM/100 cm2	pump base	
		N/A	α <17	DPM/100 cm2		
28	Smear	N/A	β 448	DPM/100 cm2	pump base	post decon #24
		N/A	α <17	DPM/100 cm2		
29	Smear	N/A	β 249	DPM/100 cm2	pump base	post decon #24
		N/A	α <17	DPM/100 cm2		
30	Smear	N/A	β 323	DPM/100 cm2	pump base	post decon #24
		N/A	α <17	DPM/100 cm2		
31	Smear	N/A	β 3155	DPM/100 cm2	post decon smear #26	
		N/A	α <16	DPM/100 cm2		
32	Smear	N/A	β 1749	DPM/100 cm2	post decon smear #26	
		N/A	α <16	DPM/100 cm2		

Fort Calhoun Station Radiation Protection Form

Data Point Details

Survey #: M-20140117-4

Map: Room 22

#	Type	Inst.	Value	Units	Position	Notes
33	Smear	N/A	β 2090	DPM/100 cm2	post decon smear #26	
		N/A	α 23	DPM/100 cm2		
34	Smear	N/A	β 1493	DPM/100 cm2	recount #33	
		N/A	α <16	DPM/100 cm2		
	Text		Room 22 in a posted			
	Note					Danger Confined Space
	Note					Smears on floor unless otherwise noted.
	Note					
	Note					
	Posting		RA			
	Posting		HCA BelowGrate			
	Posting		CRP CA		Stressing Gallery Entrance	
	Posting		CA		Around grating area	
	Posting		CA In Taped		Around pumps	

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-5 Rev. 2

JPM Title: Review Shutdown Margin Calculation

Location: Classroom

Approximate Time: 15 minutes

Start Time:__________________

End Time:___________________

Actual Time: __________________

Reference(s): K/A 2.1.37 (SRO Imp 4.6)
Knowledge of procedures, guidelines, or limitations associated with reactivity management.
TDB-V.9
TDB-II

Handout(s):

Task List #: 0062

Applicable Position(s): SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ________________________________ Date: ____________

JPM Reviewed by: ________________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-5 Rev. 2

JPM Title: Review Shutdown Margin 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: None

Safety Considerations: None

Comments: Ensure TDB-II Rev 27 is available.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-5 Rev. 2

JPM Title: Review Shutdown Margin Calculation

TASK STANDARD: **Shutdown Margin Calculation has been review to be inadequate.**

INITIAL CONDITIONS: **CEAs 37 and 41 have just been declared inoperable (untrippable) following a surveillance test.**

The plant conditions are as follows:

Reactor Power: 75%
CEA position: GRP 4 @ 100", all other CEAs fully withdrawn
Boron concentration: 900 ppm
Burnup: 6000 MWD/MTU

INITIATING CUE: **The STA has determined that shutdown margin is adequate and has asked you to review his SDM calculation.**

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-5 Rev. 1

JPM Title: Review Shutdown Margin Calculation

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
		Note to Examiner: **Provide Shutdown Margin Calculation to candidate with initiating cue.**
1.	Reviews shutdown margin calculation.	Applicant determined shutdown worth for 8 GWD/MTU mistakenly used for step 7.a and b. [SAT] [UNSAT]
2.	Reviews shutdown margin calculation.	Applicant determined that least conservative CEA worth was mistakenly used in step 9.c.ii instead of the most conservative [SAT] [UNSAT]
3.	Calculates shutdown margin using corrected values.	Determines that shutdown margin is between 2.234 and 2.204 and is not adequate. [SAT] [UNSAT]

Termination Criteria: Shutdown Margin Calculation has been review to be inadequate.

DO NOT HAND THIS OUT

ANSWER KEY "ACTUAL"

TDB-V.9 - 1		JPM BAND	
1. Present Date/Time	/		
2. Reactor Power (before trip)	75 %		
3. CEA Positions:			
a. Group 1	126 inches		
b. Group 2	126 inches		
c. Group 3	126 inches		
d. Group 4	100 inches		
4. RCS Boron Concentration	900 ppm		
5. Burnup	6000 MWD/MTU		
6. Regulating Group Worth	3.15 % Δρ		
a. Figure Used	II.B.2.b		
7. Shutdown Worths			
a. Group A	1.982 % Δρ		
b. Group B	2.974 % Δρ		
c. Total Shutdown Worth (Step 7.a + Step 7.b)	4.956 % Δρ		
8. Power Defect			
a. Power Defect per Percent power	0.0166 % Δρ / %	0.0168	0.0164
b. Total Power Defect (Step 2 X Step 8a.)	1.245 % Δρ	1.26	1.23
9. Stuck CEA Allowance			
a. Highest CEA Worth	N/A % Δρ		
b. Inoperable CEA Worth	N/A % Δρ		
c. Multiple Inoperable CEAs			
i. Number of Inoperable CEAs	2		
ii. Most Conservative CEA Worth	2.74 % Δρ		
iii. Total Inoperable CEA Worth (Step 9.c.i X Step 9.c.ii)	5.48 % Δρ		
iv. Total Available CEA Worth	7.813 % Δρ		
v. Multiple Stuck CEA Worth (Step 9.c.iii or Step 9.c.iv)	5.48 % Δρ		
d. Stuck CEA Allowance Value (9.a Step or 9.b or 9.c.v)	5.48		
10. Instantaneous Shutdown Margin= Step 9.d + Step 8.b – Step 7.c – Step 6 5.48 1.245 4.956 3.15	-1.381 % Δρ	-1.366	-1.396
11. Tech. Spec. Shutdown Margin	3.6 % Δρ		
12. Shutdown Margin (Step 10 + Step 11)	2.219 % Δρ	2.234	2.204
13. Is Shutdown Margin Adequate?	YES(≤ 0) / NO (> 0)		

R41

ANSWER KEY

NAME: ______________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS: **CEAs 37 and 41 have just been declared inoperable (untrippable) following a surveillance test.**

The plant conditions are as follows:

Reactor Power: 75%
CEA position: GRP 4 @ 100", all other CEAs fully withdrawn
Boron concentration: 900 ppm
Burnup: 6000 MWD/MTU

INITIATING CUE: **The STA has determined that shutdown margin is adequate and has asked you to review his SDM calculation.**

ANSWER:

TDB-V.9 - 1	
1. Present Date/Time	DATE / TIME
2. Reactor Power (before trip)	75 %
3. CEA Positions:	
a. Group 1	126 inches
b. Group 2	126 inches
c. Group 3	126 inches
d. Group 4	100 inches
4. RCS Boron Concentration	900 ppm
5. Burnup	6000 MWD/MTU
6. Regulating Group Worth	3.15 % Δρ
a. Figure Used	11.8.2.b
7. Shutdown Worths	
a. Group A	2.109 % Δρ
b. Group B	2.901 % Δρ
c. Total Shutdown Worth (Step 7.a + Step 7.b)	5.01 % Δρ
8. Power Defect	
a. Power Defect per Percent power	0.0166 % Δρ / %
b. Total Power Defect (Step 2 X Step 8a.)	1.254 % Δρ
9. Stuck CEA Allowance	
a. Highest CEA Worth	N/A TODAY % Δρ
b. Inoperable CEA Worth	N/A TODAY % Δρ
c. Multiple Inoperable CEAs	
i. Number of Inoperable CEAs	2
ii. Most Conservative CEA Worth	1.64 % Δρ
iii. Total Inoperable CEA Worth (Step 9.c.i X Step 9.c.ii)	3.28 % Δρ
iv. Total Available CEA Worth	7.813 % Δρ
v. Multiple Stuck CEA Worth (Step 9.c.iii or Step 9.c.iv)	3.28 % Δρ
d. Stuck CEA Allowance Value (9.a Step or 9.b or 9.c.v)	3.28
10. Instantaneous Shutdown Margin= Step 9.d + Step 8.b – Step 7.c – Step 6	− 3.626 % Δρ
11. Tech. Spec. Shutdown Margin	3.6 % Δρ
12. Shutdown Margin (Step 10 + Step 11)	− 0.026 % Δρ
13. Is Shutdown Margin Adequate?	YES(≤ 0) / NO (> 0)

Fort Calhoun Station
Unit 1

TDB-V.9

TECHNICAL DATA BOOK

SHUTDOWN MARGIN WORKSHEET

Change No.	EC 55737, 55738
Reason for Change	Change requirement in Condition Step 4 Parts I and II, to require RCS boron analysis to be performed within the past 72 hours vice 24 hours (EC 55738). Incorporate a table method to simplify the calculation. Reformat to a simpler approach (EC 55737). Major Change, no rev bars used.
Requestor	J. Willett, K. Kingston
Preparer	K. Bessey
Issue Date	05-21-13 3:00 pm

SHUTDOWN MARGIN WORKSHEET

PART I - Instantaneous Shutdown Margin for use prior to a Reactor Trip or immediately following a Reactor trip. No changes are assumed for either boron or xenon, since this worksheet is only applicable for calculation of an instantaneous shutdown margin.

NOTE: Enter values in **Table TDB-V.9-1,** exactly as determined from the figures in the Technical Data Book and carry the algebraic signs through the calculations.

Plant Conditions

1. Record Present Date/Time

2. Record Reactor Power (before trip)

3. Record CEA Group Positions

4. Record Reactor Coolant System Boron Concentration prior to shutdown (Boron concentration analysis must have been performed within the past 72 hours or more recently if boration or dilution has occurred)

5. Record Burnup - Take the most recent burnup from GARDEL OR take the most recent Burnup from the Control Room Log and add 30 MWD/MTU per EFPD to the Control Room Log Burnup Value.

Calculation of Shutdown Margin

6. Enter Regulating Group Worth, based on burnup (Step 5) and CEA positions using TDB Figure II.B.2.

7. Enter Shutdown Group Worths, based on burnup (Step 5) using TDB Figure II.B.1.a.

   a. Sum the total shutdown CEA worth by adding Group A (7.a) and Group B (7.b) and recording in line 7.c.

8. Determine Power Defect

   a. Enter Power Defect based on Reactor power level (Step 2) and burnup (Step 5) using TDB Figure II.C.2.b.

   b. Calculate power defect by multiplying Reactor Power Level (Step 2) by Power Defect per Percent Reactor Power (Step 8.a).

9. Determination of Stuck CEA Allowance (3 cases)

NOTE: Consider dropped CEAs which cannot be verified to be fully inserted as inoperable.

a. Case I - All CEAs are assumed to be operable. (No known inoperable CEAs)

(Enter N/A if this case is not applicable.)

Assume the highest worth CEAs will stick out of the core upon a Reactor trip. Enter the value of the most reactive CEA, based on burnup (Step 5), from TDB Figure II.B.1.b., lines (1) thru (3) for the pre-trip configuration. Select the higher value.

NOTE: The worth of one inoperable CEA is dependent on the configuration of the withdrawn group(s) and the inoperable CEA.

b. Case II - One CEA is known to be inoperable (per Technical Specification 2.10.2(4) a.)

(Enter N/A if this case is not applicable.)

Account for this defective CEA (and the highest worth stuck CEA) by entering only the value from lines (4) thru (17) of TDB Figure II.B.1.b. for the inoperable CEA, based on burnup (Step 5). Select the higher value.

NOTE: The worth of more than one inoperable CEA is calculated by multiplying the most conservative Stuck CEA plus Ejected CEA Worth (TDB Figure II.B.1.b. lines 4-17 by the number of inoperable CEAs).

NOTE: The values of lines (4) thru (17) of TDB Figure II.B.1.b. Include the total reactivity associated with the known inoperable CEA and the highest worth CEA which is assumed to stick out of the core upon a Reactor trip.

c. Case III - More than one CEA is known to be inoperable (per Technical Specification 2.10.2.(4)a.).

(Enter N/A if this case is not applicable.)

i. Enter total number of CEA's which are known to be inoperable per Technical Specification 2.10.2.(4) a.

ii. Enter the most conservative defective CEA worth from TDB Figure II.B.1.b. Lines (4) thru (17) depending on inoperable CEA(s) location, based on burnup (Step 5). Select the higher value.

iii. Multiply the total number of inoperable CEA's (Step 9.c.i) by the highest/ most conservative CEA Worth (Step 9.c.ii).

9.c

iv. Enter total available CEA worth from TDB Figure II.B.1.a. based on burnup (Step 5) (Use Worth Without Group N value unless Group N Rods are inserted.)

NOTE: The Rod Worth Value found in Step 9.c.iv, is the maximum CEA Worth possible, therefore using the lesser of the two values from Steps 9.c.iii and 9.c.iv is more accurate and conservative.

v. Determine the Multiple Stuck CEA Worth by selecting the minimum of either Step 9.c.iii or Step 9.c.iv and record that value.

d. Enter Stuck CEA Allowance value from Step 9.a or 9.b or 9.c.v as appropriate.

10. Calculation of the Total Instantaneous Shutdown Margin (SDM_I):

SDM_I = Stuck CEAs (Step 9.d) + Power Defect (Step 8.b) - S/D CEAs worth (Step 7.c) - Regulating CEA worth (Step 6)

11. Document the Technical Specification required Shutdown Margin per TS 2.10.1(1).

12. Calculate difference from required Shutdown Margin per TS 2.10.2(1).

NOTE: A 3.6% $\Delta\rho$ shutdown margin must be maintained in a Hot Shutdown condition, Tc > 210°F and a 3.0% $\Delta\rho$ Shutdown Margin must be maintained T_c<210°F. (Technical Specification 2.10.2(1) and TDB-VI Item 13.0).

13. Shutdown Margin check:

a. If Step 12 is less than or equal to zero, the shutdown margin is adequate.

b. If Step 12 is greater than zero, use OI-ERFCS-1, to determine the number of gallons of acid to add.

REMARKS
____
____
____
____

Completed by ______________________________ Date/Time _______/______

TDB-V.9 - 1	
1. Present Date/Time	/
2. Reactor Power (before trip)	%
3. CEA Positions:	
a. Group 1	inches
b. Group 2	inches
c. Group 3	inches
d. Group 4	inches
4. RCS Boron Concentration	ppm
5. Burnup	MWD/MTU
6. Regulating Group Worth	% Δρ
a. Figure Used	
7. Shutdown Worths	
a. Group A	% Δρ
b. Group B	% Δρ
c. Total Shutdown Worth (Step 7.a + Step 7.b)	% Δρ
8. Power Defect	
a. Power Defect per Percent power	% Δρ / %
b. Total Power Defect (Step 2 X Step 8a.)	% Δρ
9. Stuck CEA Allowance	
a. Highest CEA Worth	% Δρ
b. Inoperable CEA Worth	% Δρ
c. Multiple Inoperable CEAs	
i. Number of Inoperable CEAs	
ii. Most Conservative CEA Worth	% Δρ
iii. Total Inoperable CEA Worth (Step 9.c.i X Step 9.c.ii)	% Δρ
iv. Total Available CEA Worth	% Δρ
v. Multiple Stuck CEA Worth (Step 9.c.iii or Step 9.c.iv)	% Δρ
d. Stuck CEA Allowance Value (9.a Step or 9.b or 9.c.v)	
10. Instantaneous Shutdown Margin= Step 9.d + Step 8.b – Step 7.c – Step 6	% Δρ
11. Tech. Spec. Shutdown Margin	3.6 % Δρ
12. Shutdown Margin (Step 10 + Step 11)	% Δρ
13. Is Shutdown Margin Adequate?	YES(≤ 0) / NO (> 0)

Figure II.B.1.a

Table 1 - Fort Calhoun Station Cycle 27
CEA Group Worths at HZP in %Δρ
When Inserted Sequentially

CEA Group	Burnups (GWD/MTU)								
	0	2	4	6	8	10	12	14	15
4	0.416	0.424	0.427	0.429	0.430	0.423	0.420	0.432	0.441
3	0.546	0.570	0.562	0.553	0.542	0.534	0.542	0.550	0.555
2	1.350	1.324	1.343	1.358	1.367	1.369	1.371	1.397	1.417
1	0.873	0.898	0.928	0.962	1.002	1.058	1.105	1.115	1.116
*N	0.556	0.565	0.596	0.630	0.668	0.722	0.764	0.768	0.765
*B	3.134	3.107	3.040	2.974	2.901	2.805	2.729	2.735	2.756
*A	1.773	1.777	1.876	1.982	2.109	2.224	2.259	2.309	2.340
[*A+B]	4.907	4.884	4.916	4.956	5.010	5.029	4.988	5.044	5.096
Total Worth (w/ N)	8.648	8.665	8.772	8.888	9.019	9.135	9.190	9.306	9.390
Total Worth (w/o N)	7.677	7.694	7.751	7.813	7.878	7.917	7.953	8.083	8.170

*Group N's worth increases significantly after Groups A and B are inserted.

Table 2 - Fort Calhoun Station Cycle 27
CEA Groups 1 - 4 Worth of the Bottom 20 Inches at HZP in %Δρ

Table 2 - Fort Calhoun Station Cycle 27
CEA Groups 1 - 4 Worth of the Bottom 20 Inches at HZP in %Δρ

CEA Groups 1-4	Burnups (GWD/MTU)								
	0	2	4	6	8	10	12	14	15
Group N In	0.824	0.856	0.873	0.858	0.808	0.742	0.677	0.621	0.610
Group N Out	0.908	0.929	0.943	0.922	0.869	0.800	0.728	0.659	0.647

Figure II.B.1.b - Fort Calhoun Station Cycle 27
Reduction in Shutdown Margin or Stuck CEA(s) Worth (%$\Delta\rho$)

Condition*	Exposure (GWD/MTU)								
	0	2	4	6	8	10	12	14	15
ARO; No Known Inoperable	1.36	1.32	1.24	1.17	1.09	1.00	0.99	1.05	1.07
Group 4 In; No Known Inoperable	1.36	1.32	1.24	1.17	1.09	1.00	0.99	1.05	1.07
Groups 4+3 In; No Known Inoperable	1.36	1.32	1.24	1.17	1.09	1.00	0.99	1.05	1.07
ARO; Rod 1-6, 1-8, 1-10, or 1-12 Inoperable	2.12	2.10	2.05	2.00	1.96	1.91	1.87	1.87	1.89
ARO; Rod 2-22 or 2-26 Inoperable	2.12	2.08	2.11	2.12	2.11	2.07	2.02	2.07	2.13
ARO; Rod 2-23 or 2-27 Inoperable	2.42	2.38	2.46	2.54	2.63	2.70	2.75	2.85	2.92
ARO; Rod 2-24 or 2-28 Inoperable	2.40	2.30	2.30	2.29	2.26	2.20	2.13	2.18	2.24
ARO; Rod 2-25 or 2-29 Inoperable	2.28	2.29	2.39	2.49	2.59	2.68	2.73	2.84	2.91
ARO; Rod 3-2, 3-3, 3-4, or 3-5 Inoperable	1.97	1.96	1.90	1.83	1.76	1.67	1.62	1.66	1.69
ARO; Rod 4-1 Inoperable	1.79	1.77	1.70	1.64	1.57	1.48	1.45	1.52	1.56
ARO; Rod 4-38, 4-39, 4-40, or 4-41 Inoperable	1.85	1.80	1.72	1.64	1.55	1.42	1.38	1.46	1.50
ARO; Rod A-30 or A-34 Inoperable	2.34	2.30	2.26	2.22	2.18	2.11	2.03	2.06	2.10
ARO; Rod A-31 or A-35 Inoperable	2.74	2.71	2.71	2.71	2.73	2.72	2.75	2.85	2.92
ARO; Rod A-32 or A-36 Inoperable	2.32	2.27	2.23	2.19	2.15	2.08	2.00	2.03	2.07
ARO; Rod A-33 or A-37 Inoperable	2.75	2.73	2.73	2.74	2.76	2.76	2.74	2.84	2.91
ARO; Rod B-14 or B-16 Inoperable	2.74	2.71	2.71	2.71	2.73	2.72	2.70	2.76	2.81
ARO; Rod B-15 or B-17 Inoperable	2.75	2.73	2.73	2.74	2.76	2.76	2.74	2.80	2.84

*Inoperable rod is assumed to be "stuck out." All groups not specifically inserted are assumed to be 100% withdrawn.

Figure II.B.2.a - Cycle 27 Sequential Rod Worth vs. Rod Position
(HZP, 0 to 5 GWD/MTU)
GROUPS 1-4

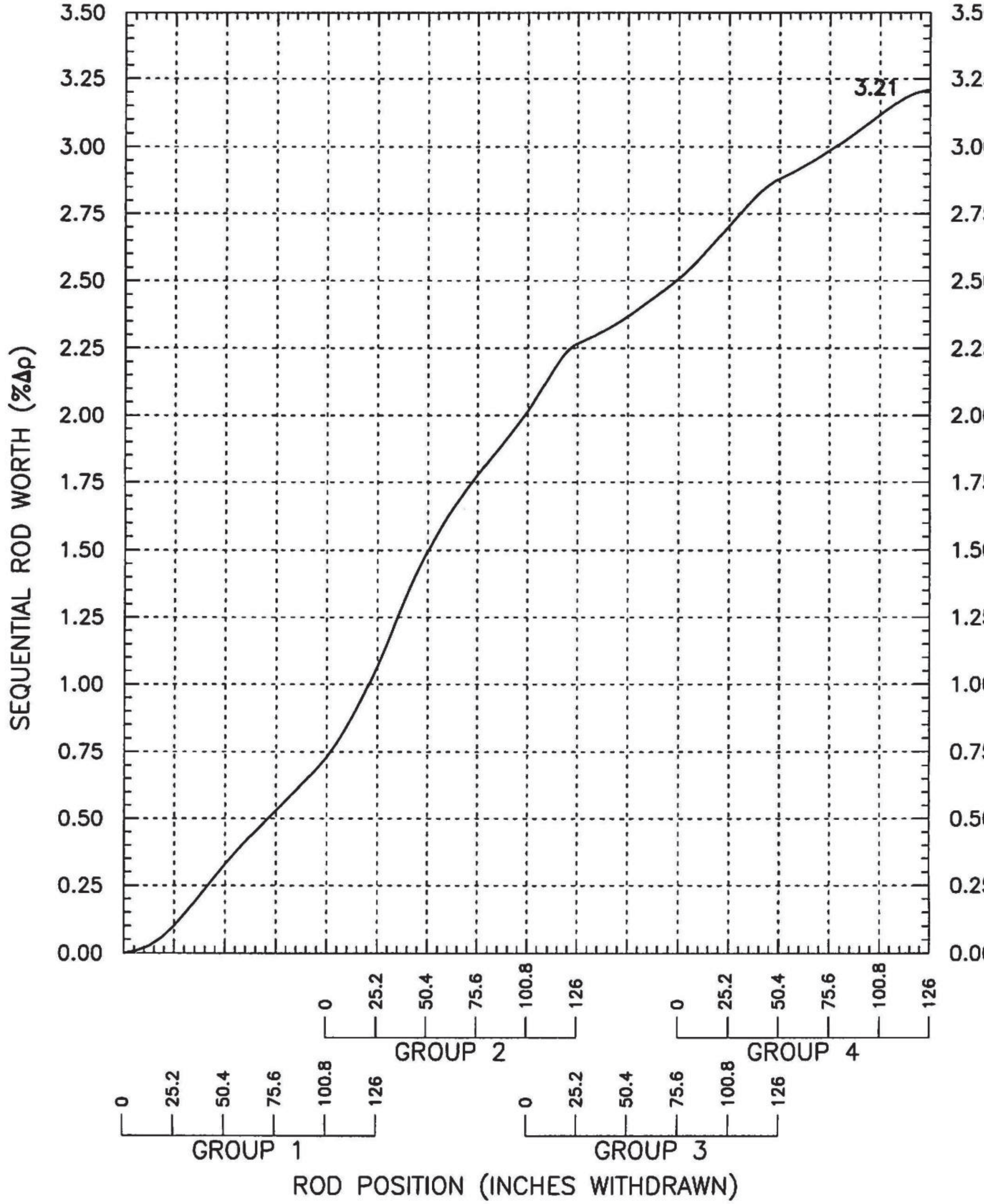
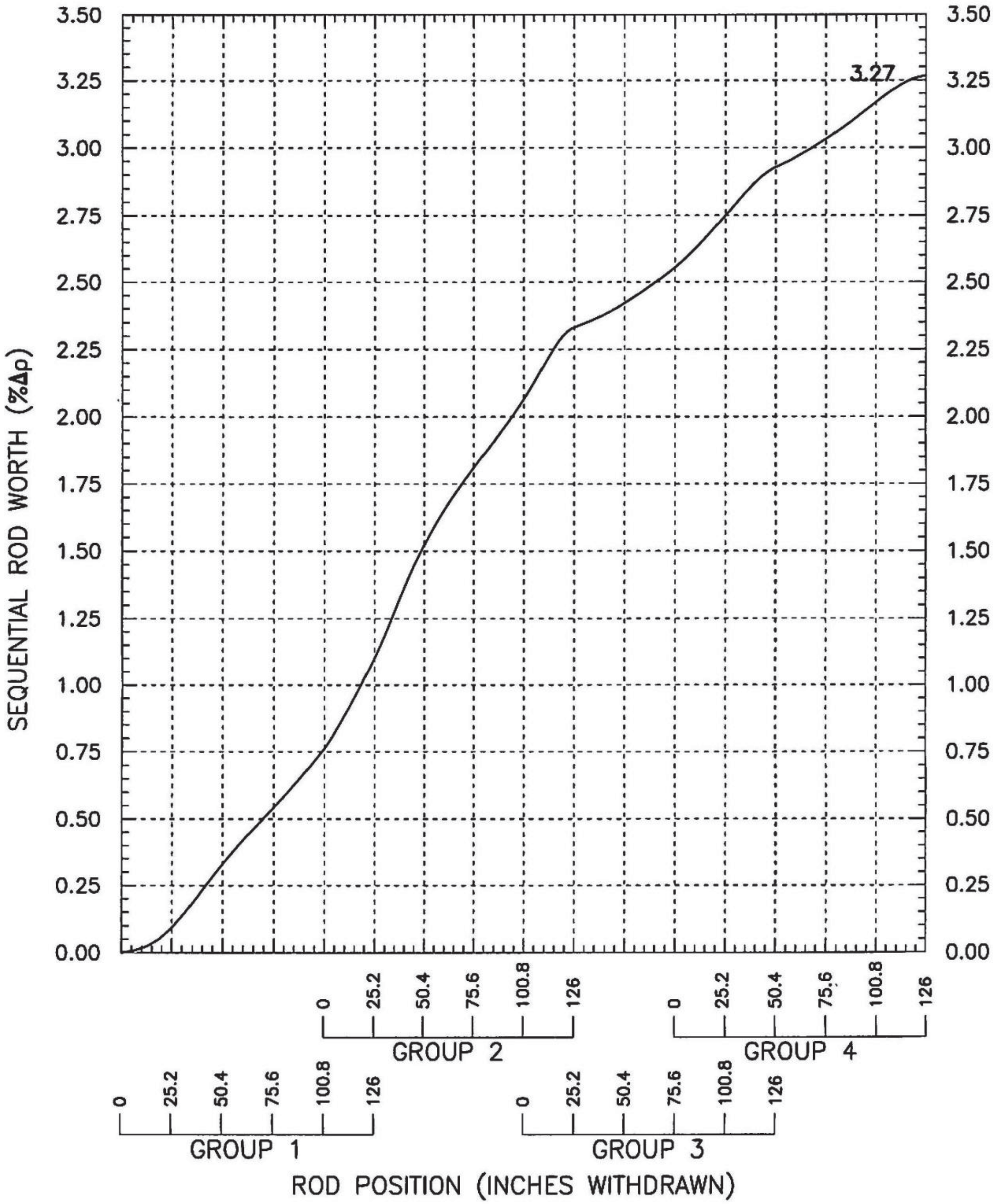


Figure II.B.2.b - Cycle 27 Sequential Rod Worth vs. Rod Position
(HZP, 5 to 7 GWD/MTU)
GROUPS 1-4



Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-6 Rev. 2

JPM Title: Determine Shift Staffing per Technical Specifications and SO-O-1

Location: Classroom

Approximate Time: 10 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A 2.1.5 (SRO Imp 4.6)
Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.
SO-O-1
T.S. 5.2.2
SO-G-52

Handout(s):

Task List #: 1656

Applicable Position(s): SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ___________

JPM Reviewed by: ______________________________ Date: ___________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-6 Rev. 2

JPM Title: Determine Shift Staffing per Technical Specifications and SO-O-1

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: None

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-6 Rev. 2

JPM Title: Determine Shift Staffing per Technical Specifications and SO-O-1

TASK STANDARD:	**Shift Staffing has been determined per T.S. 5.2.2 and SO-O-1 and actions taken to ensure requirements are met.**

INITIAL CONDITIONS:	**The Station is at 100% power and stable. You are the Shift Manager and are preparing to assume the shift when your CRS notifies you that due to an accident he will not be at work today.**

INITIATING CUE:	**Determine what actions need to be taken to assure proper Shift staffing is adhered to.**

JPM No: A-6 Rev. 2

JPM Title: Determine Shift Staffing per Technical Specifications and SO-O-1

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Obtain and review procedure SO-O-1, Conduct of Operations, 5.10, Operations Shift Manning.	Applicant obtained and reviewed SO-O-1, Conduct of Operations, 5.10, Operations Shift Manning. **NOTE to Evaluator;** SO-O-1 refers to T.S. 5.2.2 [SAT] [UNSAT]
2.	Obtain and review T.S. 5.2.2, Plant Staffing.	Applicant obtained and reviewed T.S. 5.2.2, Plant Staffing and Table 5.2-1 and determined Table 5.2-1 (ii) applies. Applicant determined Shift manning will be as specified in T.S. 5.2.2a,b,c and e [SAT] [UNSAT]
3.	Determine required actions to ensure proper staffing requirements are met.	Per T.S. 5.2.2 and Table 5.2-1(ii), Applicant determined that two SROs are required to be on-shift. 2 hours are allowed to find a relief. However, This provision does not permit any shift crew position to be unmanned upon shift change due to an oncoming shift crew member being late or absent. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
3.	Determine that the present CRS needs to be held over.	Applicant determined that the present CRS needs to be held over per T.S. Table 5.2-1 (ii). [SAT] [UNSAT]
4.	Due to T.S. Table Review Procedure SO-G-52 and determine that a maximum holdover time for the on-shift CRS is 4 hours so that the 16 hour maximum limit is not exceeded.	Applicant reviewed SO-G-52 and determined that a maximum holdover time for the on-shit CRS is 4 hours so that the 16 hour maximum limit is not exceeded. [SAT] [UNSAT]
5.	Uses the Operations Call list of SO-O-1 Section 5.10.2.B to locate an off-shift SRO to take the remainder of the shift.	Applicant uses the Operations Call list of SO-O-1 Section 5.10.2.B to locate an off-shift SRO to take the remainder of the shift. [SAT] [UNSAT] **STOP. JPM is Finished.**

Termination Criteria: **Shift Staffing has been determined per T.S. 5.2.2 and SO-O-1 and actions taken to ensure requirements are met.**

NAME: ________________________________

Fort Calhoun Station – Operations Training

JOB PERFORMANCE MEASURE

INITIAL CONDITIONS:	**The Station is at 100% power and stable. You are the Shift Manager and are preparing to assume the shift when your CRS notifies you that due to an accident he will not be at work today.**
INITIATING CUE:	**Determine what actions need to be taken to assure proper Shift staffing is adhered to.**

5.0 **ADMINISTRATIVE CONTROLS**

5.1 Responsibility

5.1.1 The plant manager shall be responsible for overall facility operation and shall delegate in writing the succession to this responsibility during his absence.

5.2 Organization

5.2.1 Onsite and offsite organizations shall be established for unit operation and corporate management, respectively. The onsite and offsite organizations shall include the positions for activities affecting the safety of the nuclear power plant.

a. Lines of authority, responsibility, and communication shall be established and defined for the highest management levels through intermediate levels to and including all operating organization positions. These relationships shall be documented and updated, as appropriate, in the form of organizational charts, functional descriptions of departmental responsibilities and relationships, and job descriptions for key personnel positions, or in equivalent forms of documentation. These requirements shall be documented in the USAR.

b. The plant manager shall be responsible for overall unit safe operation and shall have control over those onsite activities necessary for safe operation and maintenance of the plant.

c. The corporate officer with responsibility for overall plant nuclear safety shall take any measures needed to ensure acceptable performance of the staff in operating, maintaining, and providing technical support to the plant to ensure nuclear safety.

d. The individuals who train the operating staff and those who carry out health physics and quality assurance functions may report to the appropriate onsite manager; however, they shall have sufficient organizational freedom to ensure their independence from operating pressures.

5.2.2 Plant Staff

The plant staff organization shall be as described in Chapter 12 of the USAR and shall function as follows:

a. The minimum number and type of licensed and unlicensed operating personnel required onsite for each shift shall be as shown in Table 5.2-1.

5.0 **ADMINISTRATIVE CONTROLS**

5.2 Organization (Continued)

b. An Operator or Technician qualified in Radiation Protection Procedures shall be onsite when fuel is in the reactor.

c. All core alterations shall be directly supervised by either a licensed Senior Reactor Operator or Senior Reactor Operator limited to fuel handling who has no other concurrent responsibilities during the operation.

d. Fire protection program responsibilities are assigned to those positions and/or groups designated by asterisks in USAR 12.1-1 through 12.1-4 according to the procedures specified in Section 5.8 of the Technical Specifications.

e. The Manager - Shift Operations, the Shift Managers, and the Control Room Supervisors shall hold a senior reactor operator license. The Licensed Operators shall hold a reactor operator license.

5.3 Facility Staff Qualification

5.3.1 Each member of the plant staff shall meet or exceed the minimum qualifications of ANSI N18.1-1971 for comparable positions, with the exception of the Manager - Radiation Protection (MRP) and the Shift Technical Advisor (STA), the senior reactor operator licensees, and the reactor operator licensees, who shall meet the requirements set forth in Regulatory Guide 1.8, Revision 3, dated May 2000, entitled "Qualification and Training of Personnel for Nuclear Power Plants."

TABLE 5.2-1

MINIMUM SHIFT CREW COMPOSITION[ii]

License Category	Core Alteration	Cold Shutdown or Refueling Shutdown	Operating or Hot Shutdown Modes
Senior Operator License	2[i]	1	2[iii]
Operator License	2	1	2[iv]
Non-Licensed	(As required)	1	2
Shift Technical Advisor	None	None	1

(i) This includes the individual with Senior Operator License supervising Core Alterations.

(ii) Shift crew composition may be one less than the minimum requirements for a period of time not to exceed 2 hours in order to accommodate unexpected absence of on-duty shift crew members provided immediate action is taken to restore the shift crew composition to within the minimum requirements of Table 5.2-1. This provision does not permit any shift crew position to be unmanned upon shift change due to an oncoming shift crewmember being late or absent.

(iii) At least one of these individuals must be in the control room at all times.

(iv) At least one of these individuals (or the second senior licensed operator, if both senior licensed operators are in the control room) must be present at the controls at all times.

5.9 Control Room References

5.9.1 Limitations Regarding Use of References

Control Room references (curves and graphs) shall not be extrapolated beyond their axes. The assumptions made for a particular curve or graph are only valid within the relevant range presented or delineated by the axes. Therefore, extrapolation beyond the relevant range presented in the curve or graph is prohibited.

5.9.2 Reference List

5.9.2.A Abnormal Operating Procedures – See SO-O-18A.

5.9.2.B Control Room Drawings - See SO-G-47.

5.9.2.C Emergency Operating Procedures - See SO-O-18.

5.9.2.D ERF Computer - See OI-ERFCS-1

5.9.2.E Operations Memorandums - See SO-O-13.

5.9.2.F Technical Data Book

5.9.2.G Temporary Labels, Curves, Notes, and Instructions - See SO-O-41.

5.10 Operations Shift Manning

5.10.1 Responsibility

NOTE: The RERP Table B-1 requires one STA and Control Room Communicator in all modes of operation for ERO duties.

5.10.1.A It is the responsibility of the Shift Manager to ensure that the required number of Licensed and Equipment Operators are available.

5.10.1.B Additional Operations Department personnel may be required on shift because of unusual plant conditions or operational needs. The Shift Manager shall obtain the additional personnel as necessary. Activities requiring additional personnel will not be undertaken until the required personnel are available.

5.10.2 Staffing Requirements (Minimum)

5.10.2.A Shift manning will be as specified in Technical Specification 5.2.2.a, b, c, and e. When overtime is required for shift coverage, then the SM will use the operator overtime list as a guideline. When overtime is not required for on-shift needs, additional personnel shall be scheduled, as appropriate, on the weekly schedule.

5.10.2.B The Operations Call List (located in the Shift Manager's Office), the Duty Assignment Call List or the Operator overtime list will be used by the Shift Manager to facilitate the recall of personnel as required.

5.10.2.C In the event it is anticipated that these requirements cannot be satisfied, the Director, Site Operations, Manager-Shift Operations, or the Plant Manager or designated alternate shall be notified immediately.

5.10.2.D Technical Specification 5.2 designates Licensed Operator placement as follows:

5.10.2.D.1) Two Licensed individuals (Shift Manager, Control Room Supervisor, or Reactor Operator) must be within the Control Room boundary, as defined in Attachment 7.1 at all times whenever fuel is in the reactor except as noted in Step 5.10.2.E.

5.10.2.D.2) The placement of the two Licensed Operators required above must also meet the following requirements;

5.10.2.D.2)a) Either the SM or the CRS must be within the Control Room boundary, as defined in Attachment 7.1 at all times whenever fuel is in the reactor except as noted in Step 5.10.2.E.

5.10.2.D.2)b) One RO or SRO should be within the at the controls area as defined in Attachment 7.1 at all times whenever fuel is in the reactor except as noted in Step 5.10.2.E. Further clarification is provided in the OPD (Procedure Maintenance and Ownership).

5.10.2.D.2)c) Occasionally, two SRO’s are present in the Control Room. It should be clearly understood that there is only one official CRS on watch at any one time and that the functional duties of the two SRO’s are not to be swapped back and forth on the same shift. The official CRS is the one who accepted the turnover from his/her counterpart at the beginning of the shift and who signed into the shift turnover log as the oncoming CRS. This CRS shall remain as the official CRS for the duration of the shift unless properly relieved by the other CRS on-shift.

5.10.2.E The (2) Licensed members of the plant staff shall be in the Control Room at all times except during off-normal operation conditions having potential safety related impact which could jeopardize the health and safety of the public and which requires prompt operator actions outside the Control Room complex. Safety related impact is subject to Operator discretion at the time of the off-normal operating condition.

5.10.2.E.1) In the event of a Control Room Evacuation, the Control Room Supervisor shall be stationed at the Alternate Shutdown Panel. See Attachment 7.4 for CRS Operating Area.

5.10.2.F Shift crew assignments during periods of core alterations shall include a Licensed Senior Reactor Operator to directly supervise the core alterations. This Licensed Senior Reactor Operator shall not have other concurrent duties.

5.10.2.G The Manager-Shift Operations will determine the appropriate amount of management oversight during critical evolutions, and during Refueling Outages. This oversight will be documented in an Operations RFO Organizational Plan. This plan will normally designate a shutdown SRO, in case one is needed, and will provide resources for oversight in addition to the SM and CRS both in the Control Room and in the field as appropriate.

5.10.2.H Temporary absence from normal work locations may be authorized by the Shift Manager for on-shift personnel, except as specifically required by Technical Specification 5.2, to facilitate performance of required job functions, provided the on-site requirement of Technical Specification 5.2.2.a, b, and e is maintained.

5.10.2.H.1) On-site is defined as on the Owner Controlled Area at the Fort Calhoun Station site.

5.10.2.H.2) In addition to Shift Operations, the Shift Radiation Protection Technician and Chemistry Technician are included in this provision.

5.10.3 Operations Personnel for Fire Response

The following personnel are required for response to a fire inside the Protected Area. Their responsibilities will vary based on the location and severity of the fire. Refer to fire response procedures – AOP-06, SO-G-28 and E-Plan for specific actions for each staffed position.

1. Shift Manager
2. Control Room Supervisor
3. Licensed Operators – 2
4. Equipment Operator Nuclear Auxiliary (EONA)
5. Equipment Operator Nuclear Turbine (EONT)
6. Auxiliary Operator Nuclear (AON)
7. Control Room Communicator
8. Shift Technical Advisor

5.10.4 Department Work Hours

5.10.4.A Operations Staff working hour restrictions are defined in SO-G-52. It is critically important that all Operations Department personnel carefully track their workhours to ensure they do not exceed the workhour limitations.

5.10.4.B Operations staff working hour waivers shall be implemented in accordance with SO-G-52.

5.11 Pre-Shift Briefings

5.11.1 Conduct of Pre-Shift Briefings

5.11.1.A At the beginning of each shift, the on-coming Operating crew shall report to the Control Room Loft for a Pre-Shift Briefing. Seating in the loft shall be by position (Reference Attachment 7.3).

5.11.1.B The briefing shall be conducted by the off-going Shift Manager or designee. Priorities for the shift are to be provided by the on-coming SM.

NOTE: Extra Operators shall report to the Control Room Loft as part of the operating crew during normal operations.

5.11.1.C The following on-coming Shift Personnel shall attend the Pre-Shift Briefing:

5.11.1.C.1) Licensed Operators

5.11.1.C.2) Equipment Operators

5.11.1.C.3) Auxiliary Operators

5.11.1.C.4) Shift Technical Advisor

5.11.1.C.5) Shift Chemist

3.12 Training

3.12.1 Biennial refresher will be conducted for covered worker supervisors. Refresher will include:

- Significant changes to SO-G-52 or the controlling compliance software
- Recent station and industry problems (OE) pertaining to work hour rule compliance and implementation

3.13 In-Processing

3.13.1 It is the responsibility of the Supervisor to identify covered workers at the time of in-processing. See Step 3.3.1.

4.0 PROCEDURE

4.1 General

4.1.1 Work hour restrictions apply only to personnel that are currently authorized un-escorted access and who are performing Covered Work.

4.1.2 Work hour restrictions specifically do not apply to the following individuals and activities:

A. Maintenance activities performed on systems, structures, and components that are located off site;

B. Nuclear Oversight inspections and activities;

C. Predictive maintenance activities that do not result in a change of condition or state of a structure, system, or component (SSC). Predictive maintenance activities that may be excluded if they do not change the state or condition of an SSC include, but are not limited to, nondestructive examination (NDE), thermography, vibration analysis, and data collection and analysis.

D. Workers who perform non-intrusive predictive maintenance or other data collection on risk significant SSCs are not covered workers as long as they are not operating or maintaining the SSC as part of the predictive maintenance activity.

4.1.2 (continued)

E. Activities supporting covered maintenance and operations functions must be evaluated separately to determine if they are covered work per Attachment 1. Examples of supporting activities that are not considered to be covered work include the following:

- Scaffold erection and removal
- FME monitoring
- Confined space monitoring
- Quality inspections
- Engineering reviews
- Painting (with the exception of Qualified Coatings)

F. Supplemental personnel (vendors/contractors) who are not granted unescorted access (i.e., the individual(s) are escorted), but are conducting work on a risk significant system, structure, or component. In such cases, the OPPD person responsible for oversight of the supplemental worker shall ensure that work hour limits are set for the task performed and oversight is provided to ensure performance is not impacted by worker fatigue.

G. Emergency response personnel who DO NOT perform health physics or chemistry duties required as a member of the onsite Emergency Response Organization minimum shift complement.

4.1.3 Security personnel need not meet the work hour restrictions of 10 CFR 26 Subpart I when informed, in writing by the NRC, that these requirements, or any subset thereof, are waived for security personnel in order to assure the common defense and security, for the duration of the period defined by the NRC.

4.1.4 Emergency response personnel need not meet work hour restriction requirements during declared emergencies, as defined in the FCS Emergency Plan.

4.2 Work Hour Restrictions for **ON-LINE** Periods

4.2.1 FCS adheres to the Online Averaging requirements in 10 CFR 26.205(d)(7).

4.2.2 When practical, maintain a forty-hour week during normal plant operation. **AVOID** the use of overtime to meet routine operational requirements. If overtime is necessary, the use of overtime shall be considered on an individual basis and not for the entire work group.

4.2.3 Overtime **SHALL** be tested in EmpCenter prior to being worked.

4.2.4 The averaging period starts rolling after a work history has been established for a worker equal to the length of the averaging period. This period of establishing a work history is also referred to as a fixed period.

4.2.5 The averaging period advances by 7 consecutive calendar days at the finish of every averaging period. This advancing is referred to as rolling.

4.2.6 FCS has established that the week begins on Sunday at 0000 and ends the following Sunday at 0000. When an individual's work shift starts on one calendar day and concludes the next calendar day, the hours will be attributed to the calendar days on which the hours are actually worked.

4.2.7 Individuals **SHALL NOT**:

- Work more than 16 hours in any rolling 24 hour period
- Work more than 26 hours in any rolling 48 hour period
- Work more than 72 hours in any rolling 7 day period

AND

Individuals **SHALL** have a continuous 10 hour break between successive work periods. For exceptions, see note in Section 4.7.

AND

Individuals **SHALL** have a continuous 34 hour break in any rolling nine-day period.

4.2.8 In addition to the limits established above, individuals **SHALL NOT** work more than a weekly average of 54 hours, calculated using an averaging period of up to six (6) weeks, which advances by 7 consecutive calendar days at the finish of every averaging period.

4.3 Work Hour Restrictions for **OUTAGE** Periods

4.3.1 When entering an unplanned outage, unplanned security system outage, or increased threat condition, individuals will be considered to be in compliance with this standing order if the schedule for the shift cycle would have met the 54 hour calculated averaging period in 10 CFR 26.205(d)(7).

4.3.2 For security personnel, during the first 60 days of an unplanned security system outage or increased threat condition, the MDO requirements do not apply.

i	**NOTE** The 60-day period may be extended for an individual in seven-day increments for each non-overlapping seven-day period in which the individual has worked not more than 48 hours during the unit or security system outage or increased threat conditions as applicable.	i

4.3.3 An outage is defined as the time period when the unit is disconnected from the electrical grid up to a period of 60 days.

4.3.4 Security personnel MDO requirements are considered more conservative than Operations personnel MDO requirements which, in turn, are considered more conservative than Maintenance personnel MDO requirements. When an individual may be performing multiple functions, they should be assigned to the most conservative MDO requirement and not attempt to change back and forth between MDO requirements.

4.3.5 During an outage, individuals **SHALL NOT**:

- Work more than 16 hours in any rolling 24 hour period.
- Work more than 26 hours in any rolling 48 hour period.
- Work more than 72 hours in any rolling 7 day period.

AND

Individuals **SHALL** have a continuous 10 hour break between successive work periods. For exceptions, see not in Section 4.7.

AND

Individuals **SHALL** have a continuous 34 hour break in any rolling nine-day period.

i	**NOTE** For the purposes of calculating **OUTAGE MDO** requirements, the 15 day periods are fixed and not rolling.	i

4.3.6 In addition to the work hour limits, an individual worker **SHALL** meet the Minimum Day Off (MDO) requirements as listed in the table below.

OUTAGE Minimum Days Off (MDO) Requirements			
Group	**8 Hour Shifts**	**10 Hour Shifts**	**12 Hour Shifts**
Maintenance	1 day/week	1 day/week	1 day/week
Operations, RP, Chemistry	3 days off in each 15 day period	3 days off in each 15 day period	3 days off in each 15 day period
Security	4 days off in each 15 day period	4 days off in each 15 day period	4 days off in each 15 day period

4.4 Calculating Work Hours

4.4.1 Work hours for covered workers **SHALL** be calculated based on the amount of time the individual is performing duties for OPPD while the individual is authorized unescorted access at Fort Calhoun Station.

4.4.2 Work periods of less than one week, typically applicable to short term supplemental personnel, are insufficient to calculate the work hour average. Application of other portions of this standing order are sufficient to ensure well rested workers in those cases.

4.4.3 The calculated work hours **SHALL** include all time spent performing duties for OPPD, including performing covered and non-covered work, all within-shift break times, meal breaks, and rest periods during which there are no reasonable opportunities or accommodations appropriate for restorative sleep.

4.4.4 Work hours include:

A. Holding over at end of shift to cover for late arrival of incoming shift members.

B. Early arrival or holding over by individuals for required meetings, training, or pre-shift briefings for special evolutions. These activities are **NOT** considered shift turnover activities.

C. Holding over or early arrival for interviews needed for event investigations or other required OPPD business.

4.4.4 (continued)

CAUTION

A call-out before a worker has been provided a full 10-hour break may result in not meeting the 16 hours in 24 hour period requirement.

D. For call-out work periods, the time between leaving the station and the call-out work period is also included if the worker was not provided a full 10 hour break.

E. Hours worked during turnovers between individuals within a shift period due to rotations or relief within a shift.

NOTE

Off-site work hours for OPPD, such as business trips or vendor visits, off-site training, and company required professional development, although not covered work, **SHALL** be considered as worked hours. Personal time away from work, at the employee's choice, to study training materials or to attend meetings, seminars, or training is not considered work hours.

F. Hours worked off-site at the specific direction of an individual's supervisor are considered worked hours and **SHALL** be reported to the supervisor upon returning on-site.

G. Hours worked on-site at the discretion of the individual **SHALL** be considered work hours (e.g., time spent by a maintenance supervisor who comes to work on a weekend to "catch up" on work activities).

4.4.5 It is the individual's responsibility to be aware of work hour restrictions and accurately report all hours worked. Time spent in shift turnovers **MAY** be excluded from the calculation of an individual's work hours. Shift turnover includes only those activities that are necessary to safely transfer information and responsibilities between two or more individuals between shifts. Shift turnover activities may include, but are not limited to, discussions of the status of plant equipment and the status of ongoing activities, such as extended tests of safety systems and components.

4.4.6 Time spent on a break or rest period **MAY** be excluded from the calculation of an individual's work hours if there is a reasonable opportunity and accommodations for restorative sleep (e.g., a nap).

4.4.7 If an individual begins or resumes performing covered work during the calculation period, all work hours worked for OPPD, including hours worked performing duties that are not considered covered work, **SHALL** be included in the calculation of hours worked.

4.4.8 Time spent participating in the actual conduct of an **UNANNOUNCED** emergency preparedness exercise or drill **MAY** be excluded from the calculation of an individual's work hours.

4.4.9 Time spent performing unscheduled work off site (e.g., technical assistance provided by telephone from an individual's home) **MAY** be excluded from calculation of an individual's work hours provided the total duration of the work does not exceed a nominal 30 minutes during any single break period. For the purposes of compliance with the minimum break requirements and the minimum day off requirements, such duties do not constitute work periods or work shifts.

4.4.10 Shifts worked by security personnel during the actual conduct of force-on-force tactical exercises evaluated by the NRC **MAY** be excluded from calculation of hours worked. Only those hours worked in excess of 54 during the week of the exercise may be excluded.

4.5 Directing Work

4.5.1 For the purpose of compliance with this standing order, directing **ONLY** applies to Operations and Maintenance activities. Directing is defined as the exercise of control over a work activity by an individual who is directly involved in the execution of the work activity, and either makes technical decisions for that activity without subsequent technical review, or is ultimately responsible for the correct performance of that work activity.

4.5.2 Individuals who provide specific communication to a front-line covered operations or maintenance worker without review by cognizant line supervision concerning **WHAT** the worker should do, **HOW** the worker should do it, or **WHEN** the worker should perform the task are considered to be directing work.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-7 Rev. 2

JPM Title: Determine Allowed Outage Time for Failed CS Valves

Location: Classroom

Approximate Time: 12 minutes Start Time:__________________

End Time:____________________

Actual Time: _________________

Reference(s): K/A 2.2.23 (SRO Imp 4.6)
Ability to track Technical Specification limiting conditions for operations.
Technical Specifications 2.3
TDB-VIII

Handout(s):

Task List #:

Applicable Position(s): SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ________________________________ Date: ____________

JPM Reviewed by: ________________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-7 Rev. 2

JPM Title: Determine Allowed Outage Time for Failed CS Valves

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: None

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-7

JPM Title: Determine Allowed Outage Time for Failed CS Valves

TASK STANDARD:	**Outage Time for Failed CS Valve has been determined.**

INITIAL CONDITIONS:	**The plant is operating at full power. The Equipment Operator reported the airline is disconnected from the valve operator of LCV-383-1 and that he has isolated the airline.**

INITIATING CUE:	**You have been directed to determine the applicable Technical Specification(s) and required actions, if any, to be taken.**

JPM No: A-7 Rev. 2

JPM Title: Determine Allowed Outage Time for Failed CS Valves

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Determines from drawings, AOPs, TDB or plant knowledge that HCV-385 fails open without air	Applicant made determination. [SAT] [UNSAT]
2.	Refers to Technical Specification 2.3.	Applicant determined that T.S. 2.3(2)e requires that the valve must be restored to operability within 24 hours. [SAT] [UNSAT]
4.	Refers to TDB VIII	Applicant determined that with LCV-383-1 failed open, Table 1.2 determined that plant is in 24 hour LCO. [SAT] [UNSAT]
5.	Determines appropriate LCO and Action Statements.	Applicant entered Tech Specs 2.3(2)e. and determined that operation may continue for up to 24 hours with LCV-383-1 inoperable. [SAT] [UNSAT]

Termination Criteria: Outage Time for Failed CS Valve has been determined.

NAME: ________________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS:	**The plant is operating at full power. The Equipment Operator reported the airline is disconnected from the valve operator of LCV-383-1 and that he has isolated the airline.**
INITIATING CUE:	**You have been directed to determine the applicable Technical Specification(s) and required actions, if any, to be taken.**
ANSWER:	**Tech Spec(s) Entered:**
	Required Actions with Time Limits:

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System

Applicability

Applies to the operating status of the emergency core cooling system.

Objective

To assure operability of equipment required to remove decay heat from the core.

Specifications

(1) Minimum Requirements

The reactor shall not be made critical unless all of the following conditions are met:

a. The SIRW tank contains not less than 283,000 gallons of water with a boron concentration of at least the refueling boron concentration at a temperature not less than 50^{o}F.

b. One means of temperature indication (local) of the SIRW tank is operable.

c. All four safety injection tanks are operable and pressurized to at least 240 psig and a maximum of 275 psig with tank level of at least 116.2 inches (67%) and a maximum level of 128.1 inches (74%) with refueling boron concentration.

d. One level and one pressure instrument is operable on each safety injection tank.

e. One low-pressure safety injection train is operable on each associated 4,160 V engineered safety feature bus.

f. One high-pressure safety injection pump is operable on each associated 4,160 V engineered safety feature bus.

g. Both shutdown heat exchangers are operable.

h. Piping and valves shall be operable to provide two flow paths from the SIRW tank to the reactor coolant system.

i. All valves, piping and interlocks associated with the above components and required to function during accident conditions are operable. HCV-2914, 2934, 2974, and 2954 shall have power removed from the motor operators by locking open the circuit breakers in the power supply lines to the valve motor operators. FCV-326 shall be locked open.

2.0 LIMITING CONDITIONS FOR OPERATION
2.3 Emergency Core Cooling System (Continued)

(1) j. One high-pressure safety injection pump is operable on each safety injection refueling water tank-containment sump header.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

(2) Modification of Minimum Requirements

During power operation, the Minimum Requirements may be modified to allow one of the following conditions to be true at any one time. If the system is not restored to meet the minimum requirements within the time period specified below, the reactor shall be placed in a hot shutdown condition within 12 hours. If the minimum requirements are not met within an additional 48 hours the reactor shall be placed in a cold shutdown condition within 24 hours.

a. One low-pressure safety injection train may be inoperable provided the train is restored to operable status within seven (7) days.

b. One high-pressure safety injection pump may be inoperable provided the pump is restored to operable status within 24 hours.

c. One shutdown heat exchanger may be inoperable for a period of no more than 24 hours.

d. Any valves, interlocks or piping directly associated with one of the above components and required to function during accident conditions shall be deemed to be part of that component and shall meet the same requirements as listed for that component.

e. Any valve, interlock or piping associated with the safety injection and shutdown cooling system which is not covered under d. above but which is required to function during accident conditions may be inoperable for a period of no more than 24 hours.

f. One safety injection tank may be inoperable for reasons other than g. or h. below for a period of no more than 24 hours.

g. Level and/or pressure instrumentation on one safety injection tank may be inoperable for a period of 72 hours.

h. One safety injection tank may be inoperable due to boron concentration not within limits for a period of no more than 72 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.3 Emergency Core Cooling System (Continued)

(3) Protection Against Low Temperature Overpressurization

The following limiting conditions shall be applied during scheduled heatups and cooldowns. Disabling of the HPSI pumps need not be required if the RCS is vented through at least a 0.94 square inch or larger vent.

Whenever the reactor coolant system cold leg temperature is below 350°F, at least one (1) HPSI pump shall be disabled.

Whenever the reactor coolant system cold leg temperature is below 320°F, at least two (2) HPSI pumps shall be disabled.

Whenever the reactor coolant system cold leg temperature is below 270°F, all three (3) HPSI pumps shall be disabled.

In the event that no charging pumps are operable when the reactor coolant system cold leg temperature is below 270°F, a single HPSI pump may be made operable and utilized for boric acid injection to the core, with flow rate restricted to no greater than 120 gpm.

(4) Containment Sump Buffering Agent Specification and Volume Requirement

During operating Modes 1 and 2, the containment sump buffering agent baskets shall contain a volume of hydrated sodium tetraborate (NaTB) that is within the area of acceptable operation shown in Figure 2-3.

a. With the above buffering agent requirements not within limits, the buffering agent shall be restored within 72 hours.

b. With Specification 2.3(4)a required action and completion time not met, the plant shall be in hot shutdown within the next 6 hours and cold shutdown within the following 36 hours.

Basis

The normal procedure for starting the reactor is to first heat the reactor coolant to near operating temperature by running the reactor coolant pumps. The reactor is then made critical. The energy stored in the reactor coolant during the approach to criticality is substantially equal to that during power operation and therefore all engineered safety features and auxiliary cooling systems are required to be fully operable.

2.0 LIMITING CONDITIONS FOR OPERATION

2.3 Emergency Core Cooling System (Continued)

The USAR Loss of Coolant Accident analysis assumes a minimum SIRW tank inventory of 250,000 gallons has been pumped from the SIRW tank when recirculation begins. Technical Specification 2.3(1) requires that the SIRW tank contains a minimum of 283,000 gallons of usable water. This additional volume over that assumed in the USAR analysis provides sufficient margin to account for the instrument uncertainty. The SIRW tank contains water containing a boron concentration of at least the refueling boron concentration. This is sufficient boron concentration to provide a shutdown margin of 5%, including allowances for uncertainties, with all control rods withdrawn and a new core at a temperature of 54°F.[(2)]

The four pressurized safety injection tanks are of the passive type and require no outside power or safety injection actuation signal to operate. The limits for the safety injection tank pressure and volume assure the required amount of water injection during an accident and are based on values used for the accident analyses. The minimum 116.2 inch level corresponds to a volume of 825 ft^3 and the maximum 128.1 inch level corresponds to a volume of 895.5 ft^3. Prior to the time the reactor is brought critical, the valving of the safety injection system must be checked for correct alignment and appropriate valves locked. Since the system is used for shutdown cooling, the valving will be changed and must be properly aligned prior to start-up of the reactor.

The operable status of the various systems and components is to be demonstrated by periodic tests. A large fraction of these tests will be performed while the reactor is operating in the power range.

If a component is found to be inoperable, it will be possible in most cases to effect repairs and restore the system to full operability within a relatively short time. For a single component to be inoperable does not negate the ability of the system to perform its function. If it develops that the inoperable component is not repaired within the specified allowable time period, or a second component in the same or related system is found to be inoperable, the reactor will initially be put in the hot shutdown condition to provide for reduction of cooling requirements after a postulated loss-of-coolant accident. This will also permit improved access for repairs in some cases. After a limited time in hot shutdown, if the malfunction(s) is not corrected, the reactor will be placed in the cold shutdown condition utilizing normal shutdown and cooldown procedures. In the cold shutdown condition, release of fission products or damage of the fuel elements is not considered possible.

The plant operating procedures will require immediate action to effect repairs of an inoperable component and therefore in most cases repairs will be completed in less than the specified allowable repair times. The limiting times to repair are intended to assure that operability of the component will be restored promptly and yet allow sufficient time to effect repairs using safe and proper procedures.

The time allowed to repair a safety injection tank is based on the deterministic and probabilistic analyses of Reference (8). The time allowed to repair a LPSI train is based on the deterministic and probabilistic analysis of Reference (9). These analyses concluded that the overall risk impact of the completion times are either risk-beneficial or risk neutral.

The requirement for core cooling in case of postulated loss-of-coolant accident while in the hot shutdown condition is significantly reduced below the requirements for a postulated loss-of-coolant accident during power operation. Putting the reactor in the hot shutdown condition reduces the consequences of a loss-of-coolant accident and also allows more free access to some of the engineered safeguards components in order to effect repairs.

Failure to complete repairs within 48 hours of going to the hot shutdown condition is considered indicative of a requirement for major maintenance and, therefore, in such a case, the reactor is to be put into the cold shutdown condition.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

With respect to the core cooling function, there is functional redundancy over most of the range of break sizes.(3)(4)

The LOCA analysis confirms adequate core cooling for the break spectrum up to and including the 32 inch double-ended break assuming the safety injection capability which most adversely affects accident consequences and are defined as follows. The entire contents of all four safety injection tanks are assumed to be available for emergency core cooling, but the contents of one of the tanks is assumed to be lost through the reactor coolant system. In addition, of the three high-pressure safety injection pumps and the two low-pressure safety injection pumps, for both large break analysis and small break analysis it is assumed that one high pressure pump and one low pressure pump operate (5); and also that 25% of their combined discharge rate is lost from the reactor coolant system out of the break. The transient hot spot fuel clad temperatures for the break sizes considered are shown in USAR Section 14.

The restriction on HPSI pump operability at low temperatures, in combination with the PORV setpoints ensure that the reactor vessel pressure-temperature limits would not be exceeded in the case of an inadvertent actuation of the operable HPSI and charging pumps.

Removal of the reactor vessel head, one pressurizer safety valve, or one PORV provides sufficient expansion volume to limit any of the design basis pressure transients. Thus, no additional relief capacity is required.

Technical Specification 2.2(1) specifies that, when fuel is in the reactor, at least one flow path shall be provided for boric acid injection to the core. Should boric acid injection become necessary, and no charging pumps are operable, operation of a single HPSI pump would provide the required flow path. The HPSI pump flow rate must be restricted to that of three charging pumps in order to minimize the consequences of a mass addition transient while at low temperatures.

Hydrated Sodium Tetraborate (NaTB) is required to adjust the pH of the recirculation water to $\geq$ 7.0 after a loss of coolant accident (LOCA). This pH value is necessary to prevent significant amounts of iodine, released from fuel failures and dissolved in the recirculation water, from converting to a volatile form and evolving into the containment atmosphere. Higher levels of airborne iodine in containment may increase the releases of radionuclides and the consequences of the accident. A pH of $\geq$ 7.0 is also necessary to prevent stress corrosion cracking (SCC) of austenitic stainless steel components in containment. SCC increases the probability of failure of components.

NaTB is used because of the high humidity in the containment building during normal operation. Since the NaTB is hydrated, it is less likely to absorb large amounts of water from the humid atmosphere and will undergo less physical and chemical change.

Radiation levels in containment following a LOCA may cause the generation of hydrochloric and nitric acids from radiolysis of cable insulation and sump water. NaTB will neutralize these acids.

The required amount of NaTB is represented in a volume quantity converted from the Reference 7 mass quantity using the manufactured density. Verification of this amount during surveillance testing utilizes the measured volume.

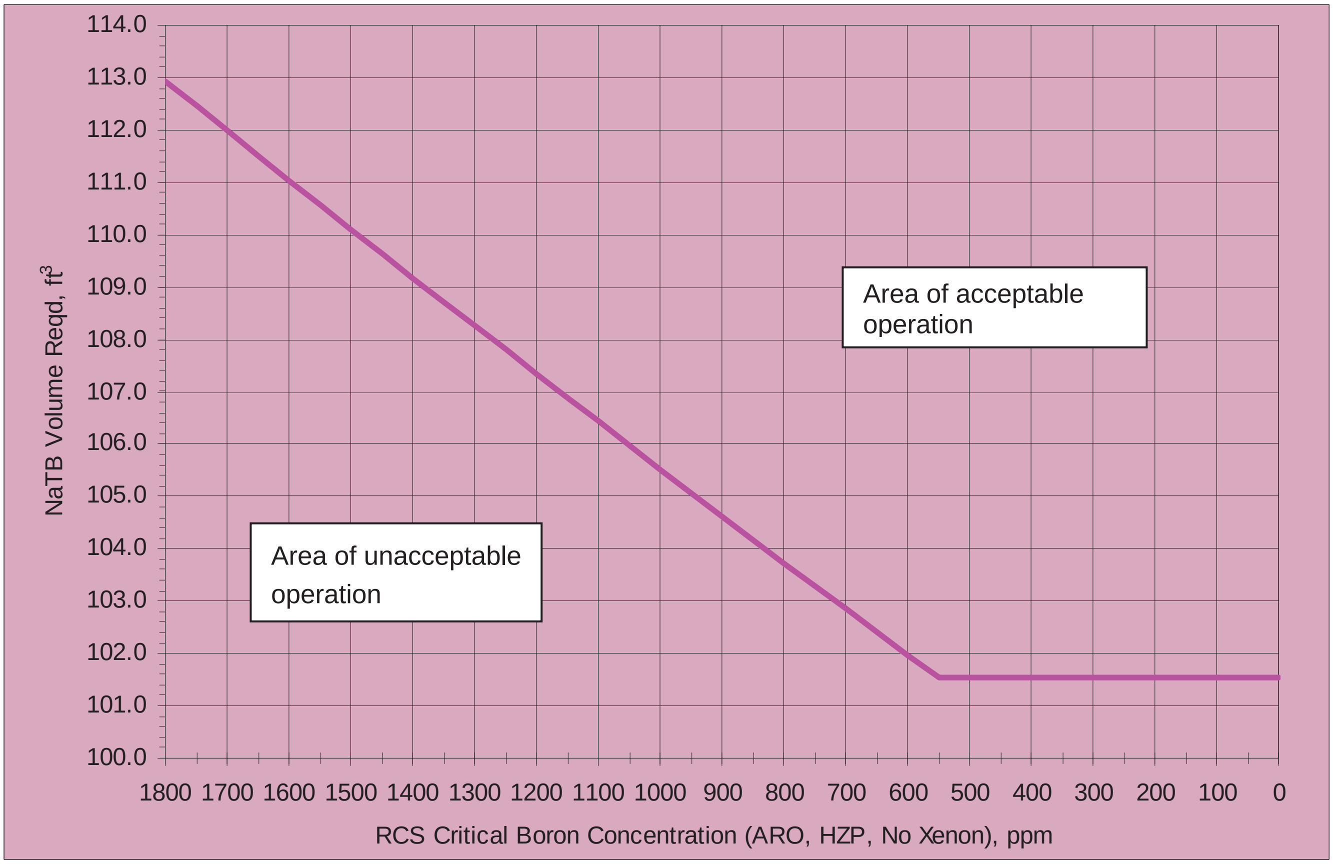
2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

References

(1) USAR, Section 14.15.1
(2) USAR, Section 6.2.3.1
(3) USAR, Section 14.15.3
(4) USAR, Appendix K
(5) Omaha Public Power District's Submittal, December 1, 1976
(6) Deleted
(7) USAR, Section 4.4.3
(8) CE NPSD-994, "CEOG Joint Applications Report for Safety Injection Tank AOT/SIT Extension," May 1995.
(9) CE NPSD-995, "CEOG Joint Applications Report for Low Pressure Safety Injection System AOT Extension," May 1995.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.3 Emergency Core Cooling System (Continued)

Figure 2-3
NaTB Volume Required for RCS Critical Boron Concentration (ARO, HZP, No Xenon)



Attachment 1 - LCO Applicable Valve Matrix

Table 1.2 - CCW, ECCS & Containment Spray

Item Tag(s)	Mode	Tech Spec LCO Applicability
HCV-304	Closed	T.S. 2.3(2)e
HCV-305	Closed	T.S. 2.3(2)e
HCV-306	Closed	T.S. 2.3(2)e
HCV-307	Closed	T.S. 2.3(2)e
HCV-311	Will Not Open	T.S. 2.3(2)e
HCV-311	Will Not Close	None
HCV-312	Will Not Open	T.S. 2.3(2)e
HCV-312	Will Not Close	None
HCV-314	Will Not Open	T.S. 2.3(2)e
HCV-314	Will Not Close	None
HCV-315	Will Not Open	T.S. 2.3(2)e
HCV-315	Will Not Close	None
HCV-317	Will Not Open	T.S. 2.3(2)e
HCV-317	Will Not Close	None
HCV-318	Will Not Open	T.S. 2.3(2)e
HCV-318	Will Not Close	None
HCV-320	Will Not Open	T.S. 2.3(2)e
HCV-320	Will Not Close	None
HCV-321	Will Not Open	T.S. 2.3(2)e
HCV-321	Will Not Close	None
HCV-327	Will Not Open	T.S. 2.3(2)e
HCV-327	Will Not Close	None
HCV-329	Will Not Open	T.S. 2.3(2)e
HCV-329	Will Not Close	None
HCV-331	Will Not Open	T.S. 2.3(2)e
HCV-331	Will Not Close	None
HCV-333	Will Not Open	T.S. 2.3(2)e
HCV-333	Will Not Close	None
HCV-478	N/A	None
HCV-497	Will Not Close	T.S. 2.4(2)d
TCV-2897A and/or TCV-2897B	N/A	None
HCV-474	Will Not Open	T.S. 2.1.1(3) (Note 9)
HCV-2898A and B	Will Not Close	None (Note 1)
HCV-2899A and B	Will Not Close	None (Note 1)

Attachment 1 - LCO Applicable Valve Matrix

Table 1.2 - CCW, ECCS & Containment Spray

Item Tag(s)	Mode	Tech Spec LCO Applicability
HCV-344	Will not Open or Close	T.S. 2.4(2)
	Not Closed and RCS ≥ 210°F	T.S. 2.6(1)a
HCV-345	Will not Open or Close	T.S. 2.4(2)
	Not Closed and RCS ≥ 210°F	T.S. 2.6(1)a
HCV-341	N/A	None
HCV-2916	Open	T.S. 2.3(2)f
HCV-2936	Open	T.S. 2.3(2)f
HCV-2956	Open	T.S. 2.3(2)f
HCV-2976	Open	T.S. 2.3(2)f
HCV-2987	Closed	T.S. 2.3(2)e
HCV-2987	Will Not Open	T.S. 2.3(2)e
HCV-2987	Will Not Close	T.S. 2.3(2)e
PCV-2909	Will Not Close	T.S. 2.3(2)e
PCV-2929	Will Not Close	T.S. 2.3(2)e
PCV-2949	Will Not Close	T.S. 2.3(2)e
PCV-2969	Will Not Close	T.S. 2.3(2)e
PCV-2909	Will Not Open	None (Note 8)
PCV-2929	Will Not Open	None (Note 8)
PCV-2949	Will Not Open	None (Note 8)
PCV-2969	Will Not Open	None (Note 8)
PCV-2839 (relief valve)	Will Not Close	Tech Spec 2.0.1 (Note 2)
AC-341 (relief valve)	Will Not Close	Tech Spec 2.0.1 (Note 2)
AC-364 (relief valve)	Will Not Close	Tech Spec 2.0.1 (Note 2)
HCV-480 or HCV-484 (AC-4A)	Will Not Open	T.S. 2.3(2)c
HCV-481 or HCV-485 (AC-4B)	Will Not Open	T.S. 2.3(2)c
LCV-383-1 or LCV-383-2	Will Not Open	T.S. 2.0.1
LCV-383-1 or LCV-383-2	Will Not Close	T.S. 2.3(2)e
HCV-383-3 or HCV-383-4	Will Not Open	T.S. 2.3(2)e
HCV-383-3 or HCV-383-4	Will Not Close	T.S. 2.0.1
HCV-385 or HCV-386	Will Not Open	Tech Spec 2.0.1 (Note 5)
HCV-385 or HCV-386	Will Not Close	T.S. 2.3(2)e (Note 6)
HCV-385 and HCV-386	Will Not Close	T.S. 2.0.1 (Note 7)
YS-351	In ALARM	T.S. 2.3(2)e (Note 3 and 4)

Attachment 1 - LCO Applicable Valve Matrix

Table 1.2 - CCW, ECCS & Containment Spray

Item Tag(s)	Mode	Tech Spec LCO Applicability
YS-352	In ALARM	T.S. 2.3(2)e (Note 5 and 6)
YS-353	In ALARM	T.S. 2.3(2)e (Note 5 and 6)
YS-354	In ALARM	T.S. 2.3(2)e (Note 5 and 6)

NOTES:

1. On a VIAS override, and BOTH valves HCV-2898A and B (or HCV-2899A and B) will not close, at least one of the Control Room Air Conditioners would be considered inoperable due to possible overheating.

2. PCV-2839, AC-341 and AC-364 are relief valves and if one (or more of these valves) is STUCK-OPEN, the operability of the CCW system has been affected by loss of Nitrogen to the CCW Surge Tank. Therefore, a more restrictive LCO (e.g., Tech Spec 2.0.1) may be entered by Operations.

3. For Tech Spec 2.3(2)e, there may be multiple inoperable components and still meet the requirements so long as no other Tech Spec modification applies.

4. For Tech Spec 2.3(2)e, the LCO time limit begins with the first inoperable component. Should additional components become inoperable while the first component is inoperable, the time limit for the LCO remains until all inoperable components are restored to operable.

5. Minimum recirculation path, prior to RAS, is required for LPSI and HPSI pump operability. T.S. 2.0.1 entry may apply.

6. At least one SIRWT Recirculation valve is required to be closed, post RAS, to prevent pumping highly radioactive water back to the SIRWT.

7. The inability of HCV-385 and HCV-386 to close would result in a loss of Containment Integrity following RAS.

8. If the leakage control valves cannot be maintained in AUTO and a pressure lock condition exists (i.e., > 500 psig on SIT Discharge Pressure Indicator) then RCS coolant leakage by may result due to lower differential pressure across the SI check valve. In this condition, contact Design Engineering for assistance in assessing System Operability.

Attachment 1 - LCO Applicable Valve Matrix

NOTES: (continued)

9. When CCW cooling is used to support an Operable Shutdown Cooling Loop, the following guidance applies:

   T.S. 2.1.1 may be applicable if CCW is isolated to an Operable Shutdown Cooling pump while the RCS is greater than 176°F. EA-FC-91-014 documents the acceptability of SI/CS pump operation with CCW isolated for operating conditions that result in Shutdown Cooling pump suction temperatures as high as 176°F. Technical Specification 2.8 may not apply when CCW is isolated from the associated Shutdown Cooling Pump because when the RCS is greater 176°F, all reactor vessel head closure bolts are fully tensioned in accordance with OP-3A.
   (Reference USAR 6.2, 6.3)

Attachment 1 - LCO Applicable Valve Matrix

Table 1.3 - Containment Coolers			
Containment Cooler	Item Tag(s)	Mode	Tech Spec LCO Applicability
VA-1A(coil) VA-3A (hsg)	HCV-400A	Nitrogen Backup Accumulator Unavailable with Valve in any position	T.S. 2.4(1) (Notes 1, 3)
	HCV-400B	Nitrogen Backup Accumulator Unavailable with Valve in any position	T.S. 2.4(1) (Notes 2, 3)
	HCV-400C	Air Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1 (Note 1)
	HCV-400D	Nitrogen Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 2)
VA-1B (coil) VA-3B (hsg)	HCV-401A	Nitrogen Backup Accumulator Unavailable with Valve in any position	T.S. 2.4(1) (Notes 1, 3)
	HCV-401B	Nitrogen Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 2)
	HCV-401C	Air Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 1)
	HCV-401D	Nitrogen Backup Accumulator Unavailable with Valve in any position	T.S. 2.4(1) (Notes 2, 3)
VA-8A (coil) VA-7C (hsg)	HCV-402A	Nitrogen Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 1)
	HCV-402B	Nitrogen Backup Accumulator Unavailable with Valve in any position	T.S. 2.4(1) (Notes 2, 3)
	HCV-402C	Air Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 1)
	HCV-402D	Nitrogen Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 2)

Attachment 1 - LCO Applicable Valve Matrix

Table 1.3 - Containment Coolers

Containment Cooler	Item Tag(s)	Mode	Tech Spec LCO Applicability
VA-8B (coil) VA-7D (hsg)	HCV-403A	Nitrogen Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 1)
	HCV-403B	Nitrogen Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 2)
	HCV-403C	Air Backup Accumulator Unavailable with Valve closed	T.S. 2.4(1) (Note 1)
	HCV-403D	Nitrogen Backup Accumulator Unavailable with Valve in any position	T.S. 2.4(1 (Notes 2, 3)

NOTES:

1. The HCV-400 (401, 402, 403) A and C valves are not required to close upon a CCW Low Flow signal and CIAS signal in order for the Containment Coolers to be operable.

2. The HCV-400 (401, 402, 403) B and D valves share a common nitrogen backup accumulator (gas cylinder).

3 Because of the effects of flow induced hydrodynamic torque, the valve is assumed to self-close when pneumatic pressure to the actuator is lost.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-8 Rev. 4

JPM Title: Approve Gas Decay Tank Release

Location: Classroom

Approximate Time: 15 minutes

Start Time:________________

End Time:________________

Actual Time: ________________

Reference(s): K/A 000000 2.3.6 (SRO Imp: 3.8)
Ability to approve release permits.
OI-WDG-2 Attachment 2, Manual Waste Gas Release
Form FC-213, Waste Gas Decay Tank Release Permit
CH-ODCM-0001, Off-Site Dose Calculation Manual

Handout(s): FC-213, Waste Gas Decay Tank Release Permit
OI-WDG-2 Attachment 2, Manual Waste Gas Release
Form FC-213, Waste Gas Decay Tank Release Permit

Task List #:0738

Applicable Position(s): SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ________________________ Date: __________

JPM Reviewed by: ________________________ Date: __________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-8 Rev. 4

JPM Title: Approve Gas Decay Tank Release

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: None

JPM No: A-8 Rev. 4

JPM Title: Approve Gas Decay Tank Release

TASK STANDARD: **The SRO candidate reviewed OI-WDG-2, Waste Gas Disposal System release, Attachment 2, Manual Waste Gas Release, and FC-213, Waste Gas Decay Tank Release Permit, and determined that:**

- **WD-29B, Waste Gas Decay Tank has only been isolated for 25 days vice the required 30 days.**
- **Section V. has the incorrect isolation date, 25-MAR-2014 vice 25-APR-2014.**

The release was not authorized as written.

INITIAL CONDITIONS: **The Plant is operating at 100% power and a release of Waste Gas Decay Tank, WD-29 B has been scheduled to be completed on your shift.**

INITIATING CUE: **You are the Shift Manager. The EONA has given you a copy of OI-WDG-2, Attachment 2 and a Release Permit for the release of WD-29B. Review the permit and the procedure. If acceptable, authorize the release. If not acceptable, mark up the procedure and or the permit explaining all reasons for not authorizing the release.**

JPM No: A-8 Rev. 4

JPM Title: Approve Gas Decay Tank Release

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Review Release Package.	Applicant reviewed the OI-WDG-2 Attachment 2 and FC-213 Release Permit. [SAT] [UNSAT]
2.	Authorize the release of WD-29B, Waste Gas Decay Tank.	Applicant determined that WD-29B, Waste Gas Decay Tank has only been isolated for 25 days vice the required 30 days. Applicant determined the isolation date in Section V. is incorrect. It should read 25-APR-2014 vice 25-MAR-2014. Applicant **DID NOT** authorize the release of WD-29B. [SAT] [UNSAT]

Termination Criteria: The SRO candidate reviewed OI-WDG-2, Waste Gas Disposal System release, Attachment 2, Manual Waste Gas Release, and FC-213, Waste Gas Decay Tank Release Permit, and determined that:

- **WD-29B, Waste Gas Decay Tank has only been isolated for 25 days vice the required 30 days.**
- **Section V. has the incorrect isolation date, 25-MAR-2014 vice 25-APR-2014.**

The release was not authorized as written.

NAME: ______________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS: **The Plant is operating at 100% power and a release of Waste Gas Decay Tank, WD-29 B has been scheduled to be completed on your shift.**

INITIATING CUE: **You are the Shift Manager. The EONA has given you a copy of OI-WDG-2, Attachment 2 and a Release Permit for the release of WD-29B. Review the permit and the procedure. If acceptable, authorize the release. If not acceptable, mark up the procedure and or the permit explaining all reasons for not authorizing the release.**

Attachment 2 - Manual Waste Gas Release

PREREQUISITES (✓) INITIALS

1. Procedure Revision Verification

Revision Number 26 Date: TODAY

2. Auxiliary Building Ventilation System is in operation per OI-VA-2.

3. One of the following Auxiliary Building Exhaust Stack Noble Gas Radiation Monitors is in operation monitoring the Ventilation Stack per OI-RM-1 (ODCM Section 3.2.2):

- RM-062 ✓
- RM-052 ✓

4. Verify one of the four following sets of CRHS/VIAS lockout relays are reset AND amber lights are on:

a.
- 86A/CRHS ✓
- 86A/VIAS ✓

b.
- 86A/CRHS ✓
- CHAN "A" DERIVED SIG CUTOFF SWITCH CS-A1/SP-A IN EMERGENCY STANDBY ✓
- 86A1/CRHS ✓
- 86A1/VIAS ✓

c.
- 86B/CRHS ✓
- 86B/VIAS ✓

d.
- 86B/CRHS ✓
- CHAN "B" DERIVED SIG CUTOFF SWITCH CS-B1/SP-B IN EMERGENCY STANDBY ✓
- 86B1/CRHS ✓
- 86B1/VIAS ✓

Attachment 2 - Manual Waste Gas Release

PREREQUISITES (continued) (✓) INITIALS

NOTES

1. The radiation monitor is considered inoperable during the Check Source. Remaining stationed at the monitor AND ensuring the monitor returns to normal before leaving the area administratively replaces the log entry.
2. Steps 5.a through 5.c is repeated for RM-052 and RM-062 as required.

5. Perform Check Source on all operational Auxiliary Building Exhaust Stack Noble Gas Radiation Monitors by completing the following:

   a. With the keypad switch in the ON position, record the background reading:

      - RM-052 4.00E+1 cpm
      - RM-062 5.00E+1 cpm ____ DJ

   NOTE

   The Check Source is only energized for a 2 minute time period.

   b. Depress the CHECK SOURCE pushbutton and verify the meter reading rises above the background reading.

      - RM-052 ✓
      - RM-062 ✓ DB

   c. WHEN the check source deenergizes,
   THEN verify the meter returns to its background reading.

      - RM-052 ✓
      - RM-062 ✓ DB

6. Verify all operational Auxiliary Building Exhaust Stack Noble Gas Radiation Monitors (RM-062 and/or RM-052) Alert and High Alarm Setpoints are per TBD-IV.7. ________

7. Attachment 4 of OI-WDG-2 has been completed within the previous 90 days. ________

Attachment 2 - Manual Waste Gas Release

PREREQUISITES (continued) (✓) INITIALS

> **NOTE**
>
> The most recently completed Checklist, OI-WDG-1-CL-B, with deviations maintained on file, may be used for alignment verification.

8. Waste Gas Disposal System is aligned for normal operation per OI-WDG-1-CL-B.

9. Verify the following recorders are operable:

   - RR-049A, Process Radiation Monitor Recorder (AI-31E) ✓
   - FR-758, Stack Total Flowrate Recorder (AI-44) ✓
   - FR-532, Waste Gas Release Rate Recorder (AI-100) ✓

10. IF one or more of the recorders is inoperable or a manual release thru the orifice is used,
THEN take applicable readings per ODCM Section 3.2.1 on FC-213, Gas Discharge Log. N/A DB TODAY

11. Record the maximum release flowrate specified in the Waste Decay Tank Release Permit, FC-213:

    907 SCFH

> **NOTE**
>
> If FIC-532 is in AUTO and the Release Flow Rate exceeds the FIC-532 Setpoint by 30 SCFH, FIC-532 will automatically close Waste Gas Flow Control Valves FCV-532A, FCV-532B, FCV-532C, and the HIGH DEVIATION FROM SET POINT alarm will be displayed on the controller.

> **CAUTION**
>
> To prevent exceeding the Maximum Release Rate specified in FC-213, the FIC-532 Setpoint should be set at least 30 SCFH below the Maximum Release Rate.

12. Record the recommended release flowrate:

    877 SCFH

Attachment 2 - Manual Waste Gas Release

PREREQUISITES (continued) (✓) INITIALS

13. At least one of the following conditions is met:

- Condenser Evacuation is in service per OI-CE-1 ✓
- VA-412, Condenser Evacuation Stack Discharge Isolation Valve, is closed ✓

14. Authorization has been given to perform a Waste Gas Decay Tank Release. ________ Shift Mgr

PROCEDURE (✓) INITIALS

> **NOTE**
>
> The following steps are located in the Auxiliary Building or as designated.

1. Record the following information:

   Permit No. ________________

   WGDT to be released:

   - WD-29A ___
   - WD-29B ___
   - WD-29C ___
   - WD-29D ___ ________

2. Complete Checklist OI-WDG-2-CL-A. ________

3. Verify the following:

   - Flow Orifice is installed upstream of WD-165 (Room 16) ___
   - Diameter of the Flow Orifice matches the Release Permit requirement ___ ________

4. Record the Installed Orifice Diameter:

   __________________ inches ________

Attachment 2 - Manual Waste Gas Release

PROCEDURE (continued) (✓) INITIALS

5. Unlock and open the following Gas Release Header Isol Valves (Rm 16):

- WD-150, Waste Gas Decay Tanks WD-29A, B, C & D Gas Release Header Isolation Valve ___
- WD-167, Waste Gas Decay Tanks WD-29A, B, C & D Gas Release Header Isolation Vlv ___ ________

6. Open WD-165, Gas Release Header Bypass Isolation Valve (Rm 16). ________

7. IF FIC-532, Flow indicating Controller Temp and Press Compen, is operable, THEN place FR-532, Waste Gas Release Flow Recorder, Chart Drive Switch in ON. ________

NOTES

1. When FIC-532 is in MANUAL, the set point indication will automatically track the Process Variable to ensure a bumpless transfer.

2. If unable to switch FIC-532 to manual, the following step will be N/A.

8. Ensure FIC-532 is as follows (AI-100):

- In MANUAL (Display indicates ME) ___
- Zero Output is indicated on the Bar Graph and digital displays ___ ________

Attachment 2 - Manual Waste Gas Release

PROCEDURE (continued) (✓) INITIALS

NOTE

Since there is no flow at this time, A50/A-4, WASTE GAS RELEASE THRU FCV-532C HI-LO Annunciator should alarm when HC-532 is placed in AUTO.

9. Place HC-532, Waste Gas Release Control Switch, in AUTO and verify the following:

- FCV-532C opens (Red Light on) (AI-100) ___
- FCV-532A remains closed (Green Light on) (AI-100) ___
- FCV-532B remains closed (Rm 16) ___ ________

NOTE

If FIC-532 is not functioning properly, the alarm may not occur.

- A50/A-4, WASTE GAS RELEASE THRU FCV-532C HI - LO Annunciator is in alarm (AI-100) ___ ________

NOTE

Step 10 need not be completed prior to performance of subsequent steps.

10. IF FIC-532 is operable AND the flow indication goes to full-scale during the release,
THEN complete the following (AI-100):

- Place HC-532 in CLOSE to immediately terminate the release ___
- Verify flow indicator is over the reference mark, ensuring the magnetic coupling on the flow transmitter was not misaligned during the rapid process change ___
- If not over the reference mark, contact I&C ___ ________

Attachment 2 - Manual Waste Gas Release

PROCEDURE (continued) (✓) INITIALS

11. Record the Date, Start Time and Permit No. on the following:

    - RR-049A, Process Radiation Monitor Recorder (AI-31E) ___
    - FR-758, Stack Total Flowrate Recorder (AI-44) ___
    - IF operable, FR-532, Waste Gas Release Rate Recorder ___
    - Control Room Log ___ ________

12. Depress F1 or F2, as necessary, to display TOTAL CU FT on FIC-532 (Refer to Figure 1 for pushbutton location). ________

13. Record Start Data on Table 2. ________

14. Depress F1 or F2, as necessary, to display FIC-532 on FIC-532 (Refer to Figure 1). ________

15. IF FIC-532 is operable,
    THEN open the selected WGDT Outlet to Gas Release Header Valve (Rm 16) AND verify Waste Gas flow is indicated on FR-532 and FIC-532.

    - WD-132, Gas Decay Tank WD-29A Outlet Valve ___
    - WD-143, Gas Decay Tank WD-29B Outlet Valve ___
    - WD-163, Gas Decay Tank WD-29C Outlet Valve ___
    - WD-177, Gas Decay Tank WD-29D Outlet Valve ___ ________

16. Calculate and log the flow rate every hour as specified on FC-213. ________

17. Commence logging VA-82 Δp readings on Table 1 every 3 hours for the duration of the release. ________

NOTE

When FIC-532 is operable and Waste Gas Flow has decreased to the point where the A50/A-4, WASTE GAS RELEASE THRU FCV-532C HI - LO Annunciator is in alarm, the WGDT pressure will be much greater than that seen for an Automatic Waste Gas Release due to the restricted flow caused by the Flow Orifice.

18. WHEN the selected WGDT has dropped to approximately 2.0 psig or as directed by the Shift Manager,
    THEN place HC-532 in CLOSE (AI-100). ________

Attachment 2 - Manual Waste Gas Release

PROCEDURE (continued) (✓) INITIALS

19. Record the Date, Termination Time and Permit No. on the following:

- RR-049A, Process Radiation Monitor Recorder (AI-31E) ___
- FR-758, Stack Total Flowrate Recorder (AI-44) ___
- IF operable, FR-532, Waste Gas Release Rate Recorder ___
- Control Room Log ___ ________

20. Record Stop Data on Table 2. ________

21. Verify the following Gas Release Control Valves closed:

- FCV-532A (AI-100) ___
- FCV-532C (AI-100) ___
- FCV-532B (Rm 16) ___ ________

22. Close the selected WGDT Outlet to Gas Release Header Valve (Rm16):

- WD-132, WD-29A ___
- WD-143, WD-29B ___
- WD-163, WD-29C ___
- WD-177, WD-29D ___ ________

23. Close and lock the following Gas Release Header Isolation Valves (Rm 16):

- WD-150 ___
- WD-167 ___ ________

____
Ind Verif

24. Close WD-165, Gas Release Header Bypass Valve (Rm 16). ________

25. Open the selected WGDT Drain Valve (Rm 16):

- WD-136, Gas Decay Tank WD-29A Drain Valve ___
- WD-149, Gas Decay Tank WD-29B Drain Valve ___
- WD-169, Gas Decay Tank WD-29C Drain Valve ___
- WD-180, Gas Decay Tank WD-29D Drain Valve ___ ________

Attachment 2 - Manual Waste Gas Release

PROCEDURE (continued) (✓) INITIALS

26. Slowly open WD-181, Gas Decay Tanks WD-29A, B, C & D Drain Header Outlet (Rm 16). ________

27. When no water is observed flowing by FI-531, Flow Indicator (Rm 16), close WD-181.

28. Close the selected WGDT Drain Valve (Rm16):

- WD-136, Gas Decay Tank WD-29A Drain Valve ___
- WD-149, Gas Decay Tank WD-29B Drain Valve ___
- WD-169, Gas Decay Tank WD-29C Drain Valve ___
- WD-180, Gas Decay Tank WD-29D Drain Valve ___ ________

29. IF FR-532 is operable or energized,
THEN place FR-532, Waste Gas Release Flow Recorder, Chart Drive Switch in OFF. ________

30. Attach the completed OI-WDG-2 and this attachment to the FC-213. ________

31. Complete FC-213. ________

Completed by____Date/Time________/______

4.2.4B (continued)

2. OPERABLE is defined as follows:

   a. Waste Gas System

      1) The waste airborne radioactive material at Fort Calhoun Station is collected in the vent header where the gas compressors take suction, compress the gas and deliver it to one of the four gas decay tanks. The waste airborne radioactive material is treated in these gas decay tanks by holding for radioactive decay prior to final controlled release to the environs. In order to provide conformance with the dose design objectives, gas decay tanks are normally stored for approximately 30 days and thus achieve decay of short half-life radioactive materials, e.g., I-131, Xe-133. Earlier release is allowed when a plant need exists and analytical results are in accordance with ALARA release objectives. If the radioactive airborne wastes from the gas decay tanks are discharged without processing in accordance with the above conditions, and it is confirmed that one half of the annual dose objective will be exceeded during the calendar quarter, a special report shall be submitted to the Commission pursuant to Section 4.2.4A.

   b. Ventilation Exhaust Systems

      1) The radioactive effluents from the controlled access area of the auxiliary building are filtered by the HEPA filters in the auxiliary building ventilation system. If the radioactive effluents are discharged without the HEPA filters, a special report shall be submitted to the NRC as defined in Action 4.2.4B.2.a above.

      2) The discharge from the gas decay tanks is routed through charcoal and HEPA filter unit VA-82. No credit was taken for the operation of hydrogen purge filters during the 10 CFR Part 50, Appendix I dose design evaluation and doses through the airborne effluent pathways were well below the design objectives. The unavailability of hydrogen purge filters will not be considered a reportable event.

WASTE GAS DECAY TANK RELEASE PERMIT

RELEASE NUMBER: 2014001

"B" WGDT

I. Permit Information:

Issue Date:	20-MAY-2014	Issue Time:	08:59
Sample Date:	15-JAN-2014	Sample Time:	21:48
Isolation Date:	25-APR-2014	Days of Isolation:	31
Preparer:	TEST	Pressure (psig):	91.0

II. Initial Plant Status:

Radiation Monitors/Sampler:

	Gross(cpm)	Bkgd(cpm)	Net(cpm)
RM-062	6.00E+01	5.OOE+01	1.00E+01

* Particulate/Iodine Sample Collection via: RM-062

NOTE - An Aux Bldg Stack Gas Monitor MUST be in operation, or WGDT samples done in accordance with the ODCM.

* NOTE - The monitor in service for gaseous analysis of the Auxiliary Building Stack should be utilized for Particulate/Iodine Sample Collection.

WASTE GAS DECAY TANK RELEASE PERMIT

RELEASE NUMBER: 2014001

"B" WGDT

III. Gamma Analysis (uCi/cc):

WGDT Sample 1: 11862		WGDT Sample 2: 11863	
* NSA *		* NSA *	
Total:	0.00E+00	Total:	0.00E+00
AEC Sum:	0.00E+00	AEC Sum:	0.00E+00

Spectrum 11863 will be used for all release calculations.

* No Significant Activity *

IV. Projected Release Information at 907 scfh:

Nuclide	WGDT Conc. (uCi/cc)	Unrestricted Area Conc. (uCi/cc)	AEC Limit (uCi/cc)	UA Fraction	Activity (uCi)

* No Significant Activity *

Projected Dose Rate Calculations:

	Dose Rate	Limit	% Limit
Total Body (mRem/yr):	0.00E+00	<= 500	0.00
Skin (mRem/yr):	0.00E+00	<=3000	0.00
Total Organ (mRem/yr):	0.00E+00	<=1500	0.00

"NSA" - (No Significant Activity) No identified activity above sample LLD.

WASTE GAS DECAY TANK RELEASE PERMIT

RELEASE NUMBER: 2014001

"B" WGDT

V. Special Instructions:

A. Verify that "B" WGDT was isolated on 25-MAR-2014 per Section I, Permit Information, prior to release. ______ / ______
Ops

B. Release Flowrate Maximum: 907 scfh MANUAL RELEASE

C. Terminate the Release if Iodine/Particulate sampling is lost and alternate sampling can not be established.

D. Make release using installed orifice of 0.10 inch diameter, with a maximum flow rate capacity at 100 psi of 907.24 scfh.

Remarks: ______________________________

WASTE GAS RELEASE PERMIT 2014001

V. Projected Cumulative Dose Information

C. Noble Gas Air Dose

	Current Release	Year to Date	Annual Obj	Percent of Annual Obj
Total Body Gamma(mRad):	0.00E+00	0.00E+00	1.00E+01	0.00%
Total Body Beta(mRad):	0.00E+00	0.00E+00	2.00E+01	0.00%

D. Iodine, Tritium, and Particulate Air Dose

	Current Release	Year to Date	Annual Obj	Percent of Annual Obj
Total Body(mRem):	0.00E+00	3.69E-04	1.50E+01	0.00%
Critical Organ(mRem):	0.00E+00	3.69E-04	1.50E+01	0.00%

VI. Approvals:

Form Revision Number Agrees
with Master Form Revision Number: ______________________
Qualified Chem Tech

Permit Reviewed by: ______________________ Date: __________
Shift Chemist

Release Approved: ______________________ Date: __________
Supervisor – System Chemistry

Reason for Release: ______________________

____

____

Authorized by: ______________________ Date: ______
FCS Plant Manager

* NOTE - Per the ODCM, a WGDT must be isolated a minimum of 30 days, unless a release is required to support plant operations.

VIII. OPERATIONS CHECKLIST (Continued)

A. Initiate Waste Gas release I.A.W 01-WDG-2 and record initial readings in Gas Discharge Log (IF APPLICABLE).* ________/______

B. During Waste Gas Release

1. Record applicable data in Gas Discharge Log* every four (4) hours, if applicable. ________/______

2. If gas release is terminated for a period prior to completion of release, record required readings in Table I of 01-WDG-2. ________/______

C. Waste Gas Release Termination

1. Terminate waste gas release I.A.W. 01-WDG-2. ________/______

2. Record final readings in Gas Discharge Log (If Applicable)* ________/______

3. Attach the working copy of the applicable operating instruction to the permit. ________/______

*(Gas Discharge Log is applicable only if one or more of the recorders itemized in 01-WDG-2 Prerequisites are in operable, or when manual release thru the orifice is used.)

____
Shift Manager

GAS DISCHARGE LOG

PERMIT No.________________ Gas Decay Tank No.____________

TIME/DATE	WASTE GAS FLOW		TOTAL STACK FLOW			AUX. BLDG NOBLE GAS MONITOR	DECAY TANK PRESSURE (psig)	SIGN OFF
	Rate	Total*	FT-758 (CFM)					
	Fr-532-SCFH or as calculated below	FIC-532-fe	FQI-758	FR-758	ERF F758			

NOTE: This log Will be used per ODCM to record applicable readings when one or more of the recorders itemized in OI-WDG-2 Prerequisites are inoperable, or when manual release thru the orifice is used.

* Not required for manual releases.

$$\text{Flow Rate} = \frac{(400\ ft^3/WGDT)\quad (L\backslash P)}{(14.7\ psia)\quad (L\backslash t)}$$

Calculate flowrate during manual releases as follows;
Where: AP = Difference between previous and current tank pressure on psia.
At= Difference between previous and current time in hours.

(CH-AD-0027)

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-9 Rev. 3

JPM Title: Emergency Plan Classification and PARs

Location: Classroom

Approximate Time: 10 minutes

Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): K/A 2.4.41 (SRO Imp 4.6)
Knowledge of the emergency action level thresholds and classifications.
EPIP-OSC-1
EPIP-EOF-7

Handout(s): FC-1188 and Eagle Data Sheet

Task List #: 0361

Applicable Position(s): SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ___________

JPM Reviewed by: ______________________________ Date: ___________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-9 Rev. 3

JPM Title: Emergency Plan Classification and PARs

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: None

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-9 Rev. 3

JPM Title: Emergency Plan Classification and PARs

TASK STANDARD:	**Emergency Plan Classification and PARs completed.**

INITIAL CONDITIONS:

A 800 gpm steam generator tube rupture has occurred in RC-2A resulting in PPLS actuation. EOP-00 has been completed and EOP-04 has been entered. The MSIV for RC-2A could not be closed. A plant cooldown is being performed using both steam generators.
The EAGLE output is attached.

The meteorological indications are as follows:

- **Indicated 10m wind speed – 12 mph, 14 mph**
- **Indicated wind direction – 120°, 128°**
- **Indicated ΔT is -1.0°C/100m, -1.2°C/100m**
- **It is raining, 0.4 inches daily total**

INITIATING CUE: **You are directed to enter the Emergency Plan, classify the event and determine offsite Protective Action Recommendations.**

Complete page 1 of form FC-1188.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: A-9 Rev. 3

JPM Title: Emergency Plan Classification and PARs

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Refer to Emergency Plan	Applicant referred to EPIP-OSC-1F. [SAT] [UNSAT]
2.	Classify the event.	Applicant classified as a FS1- Site Area, Loss or Potential Loss of ANY Two Barriers, Applicant documented the following on for FC-1188: Fuel Cladding = N/A RCS = EAL 2, Loss Containment = EAL 3 Loss [SAT] [UNSAT]
3.	Determine Protective Action Recommendations.	Applicant referred to EPIP-EOF-7 and determined that there are no PARs for this situation. Applicant documented "None" for 0-2 Miles, 2-5 Miles and 5-10 Miles for PARS on form FC-1188. [SAT] [UNSAT]
4.	Document other items on form FC-1188.	Applicant documented information on FC-1188. • Wind from – 120° - 128° • Wind Speed – 12 mph • Precipitation – Yes • Stability class – D • There is an airborne radioactive release • Prognosis is worsening • Plant is shutdown [SAT] [UNSAT]

STEP	ELEMENT	STANDARD

Termination Criteria: **Emergency Plan Classification and PARs completed.**

FORT CALHOUN STATION – EMERGENCY NOTIFICATION FORM

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

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#: N/A (If Fission Product Barrier, complete box #6)
[ ] NOUE	[ ] Alert	[X] Site Area	[ ] General	[ ] None	FS1	

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

5. Protective Action Recommendations (PARs)

	None	Evacuate Sectors	Shelter Sectors
0-2 Miles	✓	N/A	N/A
2-5 Miles	✓	N/A	N/A
5-10 Miles	✓	N/A	N/A

6. Complete if Fission Product Barrier

Fuel Cladding:
EAL # N/A Loss/ Potential Loss (Circle one)

RCS:
EAL # 2 Loss / Potential Loss (Circle one)

Containment:
EAL# 3 Loss / Potential Loss (Circle one)

7. Time PAR information given: ________ **(This time is to be filled out by the Person Making Off-Site Report.)**

8. Time Event Declared:	9. Time Event Terminated:	10. Prognosis [ ] Stable [X] Worsening	11. Plant Status [ ] At Power [X] Shutdown

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

12. Wind From Degrees(10m): 120	13. Wind Speed MPH (Use Slowest 10m): 12	14. Precipitation: [X] Yes [ ] No

15. Temperature Difference ________ °C/100m (use most positive ΔT)

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

17. 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

18. Remarks

Approved:	Date:	Time:

CONFIRMED TIME (COUNTY USE ONLY) ________

NAME: ______________________________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS: **A 800 gpm steam generator tube rupture has occurred in RC-2A resulting in PPLS actuation. EOP-00 has been completed and EOP-04 has been entered. The MSIV for RC-2A could not be closed. A plant cooldown is being performed using both steam generators.**
The EAGLE output is attached.

The meteorological indications are as follows:

- **Indicated 10m wind speed – 12 mph, 14 mph**
- **Indicated wind direction – 120°, 128°**
- **Indicated ΔT is -1.0°C/100m, -1.2°C/100m**
- **It is raining, 0.4 inches daily total**

INITIATING CUE: **You are directed to enter the Emergency Plan, classify the event and determine offsite Protective Action Recommendations.**

Complete page 1 of form FC-1188.

FORT CALHOUN STATION – EMERGENCY NOTIFICATION FORM

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

1. [ ] **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#: (If Fission Product Barrier, complete box #6)
[ ] NOUE	[ ] Alert	[ ] Site Area	[ ] General	[ ] None		

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

5. Protective Action Recommendations (PARs)

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

6. __Complete if Fission Product Barrier__

Fuel Cladding:
EAL # ________ Loss/ Potential Loss (Circle one)

RCS:
EAL # ________ Loss / Potential Loss (Circle one)

Containment:
EAL# ________ Loss / Potential Loss (Circle one)

7. Time PAR information given: _________ **(This time is to be filled out by the Person Making Off-Site Report.)**

8. Time Event Declared:	9. Time Event Terminated:	10. Prognosis [ ] Stable [ ] Worsening	11. Plant Status [ ] At Power [ ] Shutdown

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

12. Wind From Degrees(10m):	13. Wind Speed MPH (Use Slowest 10m):	14. Precipitation: [ ] Yes [ ] No

15. Temperature Difference _________ °C/100m (use most positive ΔT)

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

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

18. Remarks

Approved:	Date:	Time:

CONFIRMED TIME (COUNTY USE ONLY) _________

PAR WORK SHEET
TRAINING

Eagle Version: 6.0
User ID: LOCAL Date: Today 2014
Plume Segment No: 1 Transmittal Time: 10:30:30 Time: 10:30:30 AM

---

1. Location: ( ) CONTAINMENT (X) STACK ( ) CDSR/M STM ( ) RW BLD
2. ESTIMATED RELEASE DURATION: 4.000
3. QUANTITY AND RATE:
   8.21 E+00 CURIES NOBLE GAS AT 3.42 E-02 CURIES/SECOND
   5.75 E-02 CURIES IODINE AT 2.40 E-04 CURIES/SECOND
   0.00 E+00 CURIES PARTICULATE AT 0.00 E-00 CURIES/SECOND

4. CORE STATUS: UNDAMAGED
5. METEOROLOGICAL:
   ATMOSPHERIC MIXING CONDITION: UNLIMITED
   WIND SPEED 12(MPH) WIND DIRECTION: FROM 120 (DEG)
   DELTA T: -1.0(DEG) AMBIENT TEMP: 8 (DEG C)
   VERT. STABILITY: D

6. Affected Sectors: P, Q

7.

	A. PROJECTED DOSE RATE (REM/HR)		B. PROJECTED INTEGRATED DOSE (REM)	
	TEDE	CDE	TEDE	CDE
SITE BOUNDARY:	4.47 E-04	6.38 E-03	1.79 E-03	2.55 E-02
AT 2 MILES:	1.02 E-04	1.45 E-03	4.09 E-04	5.79 E-03
AT 5 MILES:	0.00 E+00	3.74 E-04	1.07 E-04	1.50 E-03
AT 10 MILES:	0.00 E+00	1.34 E-04	0.00 E+00	5.35 E-04

Notes: 1. Calculated using the Straightline Gaussian Model.
2. Doses/Rates < 1E-4 are displayed as zero.
3. Red indicates Action Required.

Reviewed by: ______________________________

Path	Monitor Name	Value	Unit	Flow Rate
Aux Building Stack	RM-063	1.00 E-03	uCi/cc	72500
Iodine Ratio: 7.00 E-03	Particulate Ratio: 0.00 E+00			

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-1 Rev 0

JPM Title: Energizing 480V Buses from 13.8 KV

Location: Switchgear Rooms and Upper Electrical Penetration Rooms.

Approximate Time: 20 minutes Start Time:____________________

End Time:____________________

Actual Time: ____________________

Reference(s): K/A 055 EA1.07 Restoration of power from offsite (RO 4.3/SRO 4.5)
Ability to operate and monitor the following as they apply to a Station Blackout: (CFR 41.7 / 45.5 / 45.6)

EOP/AOP Attachments- MVA-22, "Energizing 480 V Buses From 13.8 KV"

Handout(s): EOP/AOP Attachment MVA-22, "Energizing 480 V Buses From 13.8 KV"

Task List #: MTL 0958

Applicable Position(s): EO/RO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ____________

JPM Approved by: ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-1 Rev 0

JPM Title: Energizing 480V Buses from 13.8 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:	Breaker racking handle from SM or AOP-6 locker
Safety Considerations:	Electrical Safety when simulating manipulation of breakers and situational awareness to close proximity to of operating equipment.
Comments:	Applicant will start on step 3 of EOP/AOP Attachment –MVA 22.

Fort Calhoun Station – Operations Training

JOB PERFORMANCE MEASURE

JPM No: P-1 Rev 0

JPM Title: Energizing 480V Buses from 13.8 KV

TASK STANDARD:	**480V buses 1B3C and 1B3C-4C are energized from the 13.8 KV supply.**

INITIAL CONDITIONS:	• **A station blackout has occurred.** • **Both 161 KV and 345 KV supplies to the station have been lost.** • **Both Diesel Generators have failed to start.** • **Energy Marketing reports that 13.8 KV power is available to the plant.**

INITIATING CUE:	**You are the Equipment Operator and have been directed to energize 480 volt buses 1B3C, 1B3C-4C and 1B4C using EOP/AOP Attachment MVA-22. The Control Room Operators have completed steps 1 and 2.**

JPM No: P-1 Rev 0

JPM Title: Energizing 480V Buses from 13.8 KV

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
Applicant starts at Step 3 of EOP/AOP Attachment-MVA 22.		
3	Trip **ALL** of the following 480 V breakers (East Switchgear Room): • 1B3C, "T1B-3C MAIN SECONDARY FEED TO 480 VAC BUS 1B3C." • 1B3C-2, "MCC-3C2 AUX BUILDING (CORR. 26)." • 1B3C-7, "TURBINE BUILDING CRANE HE-3." • 1B3C-6, "CONTAINMENT SPRAY PUMP SI-3A." • 1B3C-3, "OUTDOOR LIGHTING XFMR T1C-3B." • 1B3C-5, "MCC-3C3 SERVICE BLDG (3RD FLOOR)." • 1B3C-8, "AIR COMPRESSORCA-1A FEED TO LOCAL CONTACTOR."	**(East SWGR room)** Applicant simulated tripping each breaker and verified breaker position indicators displayed "OPEN." • 1B3C • 1B3C-2 • 1B3C-7 • 1B3C-6 • 1B3C-3 • 1B3C-5 • 1B3C-8 [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
4	Trip **ALL** of the following 480 V breakers: • 1B3C-4C-2, "BREAKER UNIT MCC-3C4C-2 TURBINE BLDG (MEZZANINE)." • 1B3C-4C-3, "BREAKER UNIT CONTAINMENT COOLING FAN VA-7C." • 1B3C-4C-4, "BREAKER UNIT COMPONENT COOLING WATER PUMP AC-3C."	**(East SWGR room)** Applicant simulated tripping each breaker and verified breaker position indicators displayed "OPEN." • 1B3C-4C-2 • 1B3C-4C-3 • 1B3C-4C-4 [SAT] [UNSAT]
5	Trip **ALL** of the following 480 V breakers (West Switchgear Room): • 1B4C, "T1B-4C MAIN SECONDARY FEED TO 480 VAC BUS 1B4C" • 1B4C-8, "CONTAINMENT COOLING & FILTER FAN VA-3B" • 1B4C-3, "MCC-4C2 AUX BLDG (CORR 4)" • 1B4C-4, "MCC-4C3 TURB BLDG (MEZZANINE)" • 1B4C-7, "MCC-4C4 INTAKE STRUCTURE" • 1B4C-5, "HI PRESS SAFETY INJ. PUMP SI-2B" • 1B4C-2, "MCC-4C1 ELECT PENET. AREA (RM 57W)" • 1B4C-1, "MCC-4C5 MOTOR CONTROL CENTER TURBINE BUILDING"	**(West Switchgear room)** **Note to Evaluator:** After Applicant identifies location of bus 1B4C provide CUE. Applicant identified the location of bus 1B4C. **CUE: The Control Room reports that Step 5 of EOP/AOP Attachment MVA-22 has been completed previously by another Operator and the step can be signed off as being complete.** Applicant signed off Attachment MVA-22 Step 5 per the Cue. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
6	Place **ALL** of the following breakers in "OFF" • MCC-3C1-A01, "PCV-102-1 PZR POWER OPERATED RELIEF VALVE." • MCC-3C1-A2R, "AUX BLDG ROOF-DS, AUX BLDG ROOF STRESS TEST DISC SWITCH." • MCC-3C1-A3L, "MPP-58/EE-98 MOTOR PROTECTION PANEL TRANSFORMER." • MCC-3C1-A3R, "HE-12-DS/STRESS GALL-DS, ROOM 66 HOIST & STRESS GALLERY TEST DISC SWITCHES." • MCC-3C1-A4L, "SPARE." • MCC-3C1-A4R, "EE-4Q INVERTER "C" EE-8K BYPASS TRANSFORMER." • MCC-3C1-A05, "TRANSFORMER T1B-3C COOLING FANS."	**(East Upper Electrical Penetration Room)** Applicant simulated placing breakers in the OFF position. MCC-3C1-A01 MCC-3C1-A2R MCC-3C1-A3L MCC-3C1-A3R MCC-3C1-A4R MCC-3C1-A05 [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
7	Energize Bus 1B3C by performing the following: a. Obtain Circuit breaker handle from the SM or AOP-6 cabinet.	**(SM Office or AOP-6 Cabinet)** **Note to Evaluator; If Applicant has a IC35 key, toolbox may be opened.** After Applicant locates the locked toolbox; **CUE: You have obtained the circuit breaker handle.** [SAT] [UNSAT]
7 cont.	b. Close breaker 1B3C-4, "EMERG. FEED TO BUS 1B3C FROM 13.8KV/480V XFMR T1B-3C-1."	**(East Switchgear room)** Applicant simulated closing breaker 1B3C-4 and verified breaker position indicators display CLOSED. [SAT] [UNSAT]
8.	Check that Bus 1B3C is energized.	**(East Switchgear room)** Applicant checked indication on VG-1/1B3C Voltmeters T1B-3C Secondary Phase (1,2,3) (Line to GND) and amber lights for each phase. After Applicant locates and verifies indications, **CUE: The indications are as you see them now.** [SAT] [UNSAT]
9.	Close **BOTH** of the following 480 V breakers: • BT-1B3C, "BUS TIE 1B3C & 1B3C-4C NORMALLY CLOSED" (East Switchgear Room)	**(East Switchgear Room)** Applicant simulated closing BT-1B3C and verified breaker position indicators display CLOSED. After Applicant starts to proceed to BT-1B4C provide Cue. **CUE:** **Stop. The JPM is finished.** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD

Termination Criteria: **480 V Bus 1B3C is energized from the 13.8 KV system.**

INITIAL CONDITIONS:	• A station blackout has occurred. • Both 161 KV and 345 KV supplies to the station have been lost. • Both Diesel Generators have failed to start. • Energy Marketing reports that 13.8 KV power is available to the plant.

INITIATING CUE:	You are the Equipment Operator and have been directed to energize 480 volt buses 1B3C, 1B3C-4C and 1B4C using EOP/AOP Attachment MVA-22. The Control Room Operators have completed steps 1 and 2.

Attachment MVA-22

Energizing 480 V Buses From 13.8 KV

INSTRUCTIONS

1. Trip **BOTH** of the following 4160 V breakers:

   - T1B-3C
   - T1B-4C

2. Place the following control switches in "PULL-TO-LOCK":

   - CA-1A, Air Compressor
   - AC-3C, CCW pump
   - SI-2B, HPSI Pump
   - VA-3B, Containment Vent Fan
   - SI-3A, CS Pump
   - VA-7C, Containment Vent Fan

CONTINGENCY ACTIONS

Attachment MVA-22

Energizing 480 V Buses From 13.8 KV

INSTRUCTIONS	CONTINGENCY ACTIONS

3. Trip **ALL** of the following 480 V breakers (East Switchgear Room):

- 1B3C, "T1B-3C MAIN SECONDARY FEED TO 480 VAC BUS 1B3C"
- 1B3C-2, "MCC-3C2 AUX BUILDING (CORR. 26)"
- 1B3C-7, "TURBINE BUILDING CRANE HE-3"
- 1B3C-6, "CONTAINMENT SPRAY PUMP SI-3A"
- 1B3C-3, "OUTDOOR LIGHTING XFMR T1C-3B"
- 1B3C-5, "MCC-3C3 SERVICE BLDG (3RD FLOOR)"
- 1B3C-8, "AIR COMPRESSOR CA-1A FEED TO LOCAL CONTACTOR"

Attachment MVA-22

Energizing 480 V Buses From 13.8 KV

INSTRUCTIONS | CONTINGENCY ACTIONS

4. Trip **ALL** of the following 480 V breakers (East Switchgear Room):

- 1B3C-4C-2, "BREAKER UNIT MOTOR CONTROL CENTER MCC-3C4C-2 TURBINE BLDG"
- 1B3C-4C-3, "BREAKER UNIT CNTMT CLG FAN VA-7C"
- 1B3C-4C-4, "BREAKER UNIT COMPONENT CLG WATER PUMP AC-3C"

Attachment MVA-22

Energizing 480 V Buses From 13.8 KV

INSTRUCTIONS | CONTINGENCY ACTIONS

5. Trip **ALL** of the following 480 V breakers (West Switchgear Room):

- 1B4C, "T1B-4C MAIN SECONDARY FEED TO 480 VAC BUS 1B4C"
- 1B4C-8, "CONTAINMENT COOLING & FILTER FAN VA-3B"
- 1B4C-3, "MCC-4C2 AUX BLDG (CORR 4)"
- 1B4C-4, "MCC-4C3 TURB BLDG (MEZZANINE)"
- 1B4C-7, "MCC-4C4 INTAKE STRUCTURE"
- 1B4C-5, "HI PRESS SAFETY INJ. PUMP SI-2B"
- 1B4C-2, "MCC-4C1 ELECT PENET. AREA (RM 57W)"
- 1B4C-1, "MCC-4C5 MOTOR CONTROL CENTER TURBINE BUILDING"

Attachment MVA-22

Energizing 480 V Buses From 13.8 KV

INSTRUCTIONS | CONTINGENCY ACTIONS

6. Place **ALL** of the following breakers in "OFF" (East Upper Electrical Penetration Room):

- MCC-3C1-A01, "PCV-102-1 PZR POWER OPERATED RELIEF VALVE"
- MCC-3C1-A2R, "AUX BLDG ROOF-DS, AUX BLDG ROOF STRESS TEST DISC SWITCH"
- MCC-3C1-A3L, "MPP-58/EE-98 MOTOR PROTECTION PANEL TRANSFORMER"
- MCC-3C1-A3R, "HE-12-DS/STRESS GALL-DS, ROOM 66 HOIST & STRESS GALLERY TEST DISC SWITCHES"
- MCC-3C1-A4L, "SPARE"
- MCC-3C1-A4R, "EE-4Q INVERTER "C" EE-8K BYPASS TRANSFORMER"
- MCC-3C1-A05, "TRANSFORMER T1B-3C COOLING FANS"

Attachment MVA-22

Energizing 480 V Buses From 13.8 KV

INSTRUCTIONS | CONTINGENCY ACTIONS

7. Energize Bus 1B3C by performing the following:

   a. Obtain the circuit breaker handle from the Shift Manager or the AOP-06 Cabinet.

   b. Close breaker 1B3C-4, "EMERG FEED TO BUS 1B3C FROM 13.8 KV/480 XFMR T1B-3C-1" (East Switchgear Room).

8. Check that Bus 1B3C is energized.

9. Close **BOTH** of the following 480 V breakers:

   - BT-1B3C, "BUS TIE 1B3C & 1B3C-4C NORMALLY CLOSED" (East Switchgear Room)

   - BT-1B4C, "BUS TIE 1B4C & 1B3C-4C NORMALLY OPEN" (West Switchgear Room)

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-2 Rev. 1

JPM Title: Initiate Air Compressor Backup Cooling to CA-1A

Location: Room 19

Approximate Time: 10 minutes

Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): NRC K/A 078 K1.04 Cooling Water to Compressor (RO2.6/ SRO 2.9)
Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: Cooling Water to Compressor. (CFR: 41.2 to 41.9 / 45.7 to 45.8)

EOP-20, MVA-IA
AOP-20

Handout(s): AOP-20

Task List #: 0225

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ____________

JPM Reviewed by: ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-2 Rev. 1

JPM Title: Initiate Air Compressor Backup Cooling to CA-1A

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: Observe all local Industrial Safety postings.

Comments: This JPM will be performed as a static JPM.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-2 Rev. 1

JPM Title: Initiate Air Compressor Backup Cooling to CA-1A

TASK STANDARD: **Potable Water backup cooling is being supplied to CA-1A and it is running.**

INITIAL CONDITIONS:

- **The Plant is recovering from a Station Blackout.**
- **No Air Compressor is in service.**
- **Turbine Plant Cooling Water is not available.**

INITIATING CUE: **You are an extra RO on-shift and have been directed to align Potable Water to Air Compressor, CA-1A for backup cooling in accordance with AOP-20 Step 15 so it can be started.**

JPM No: P-2 Rev. 1

JPM Title: Initiate Air Compressor Backup Cooling to CA-1A

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
15.	Align backup Potable Water Cooling to **ANY** or all of the Air Compressors by performing step a, b or c:	Per the Initiating Cue the Applicant selected CA-1A and started with Step 15.a. [SAT] [UNSAT]
15.a.	Align Potable Water Cooling to CA-1A, Air Compressor, by performing the following steps: 1) Close **ALL** of the following valves (Room 19): • AC-584, "AIR COMPRESSOR CA-1A INTERCOOLER INLET VALVE" • AC-588, "AIR COMPRESSOR CA-1A OUTLET VALVE" • AC-586, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A INLET VALVE" • AC-589, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A OUTLET VALVE"	**(Room 19)** **Note to Evaluator; Student simulates closing valves by turning hand wheels in CW direction. (Valve Stem goes in.)** If needed for any of the valves, **CUE: Use pointing device to indicate stem position for each valve or say as you stated.** Applicant simulated closing AC-584. Applicant simulated closing AC-588 Applicant simulated closing AC-586. Applicant simulated closing AC-589. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
15.a	2) Open ALL of the following Potable Water valves: • AC-583, "AIR COMPRESSOR CA-1A INTERCOOLER INLET PRESS INDICATOR PI-1942A ROOT VALVE" • AC-1042, "AIR COMPRESSOR CA-1A INTERCOOLER POTABLE WATER INLET VALVE" • AC-1044, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A POTABLE WATER INLET VALVE" • AC-1028, "COMP COOLING WTR VALVE FCV-1990 A BYPASS VALVE"	**(Room 19)** **Note to Evaluator; Applicant simulated opening valves by turning hand wheels in CCW direction. (Valve Stem goes in.)** If needed for any of the valves, **CUE: Use pointing device to indicate stem position for each valve or say as you stated.** The Applicant simulated opening AC-583. The Applicant simulated opening AC-1042. The Applicant simulated opening AC-1044. The Applicant simulated opening AC-1028. [SAT] [UNSAT]

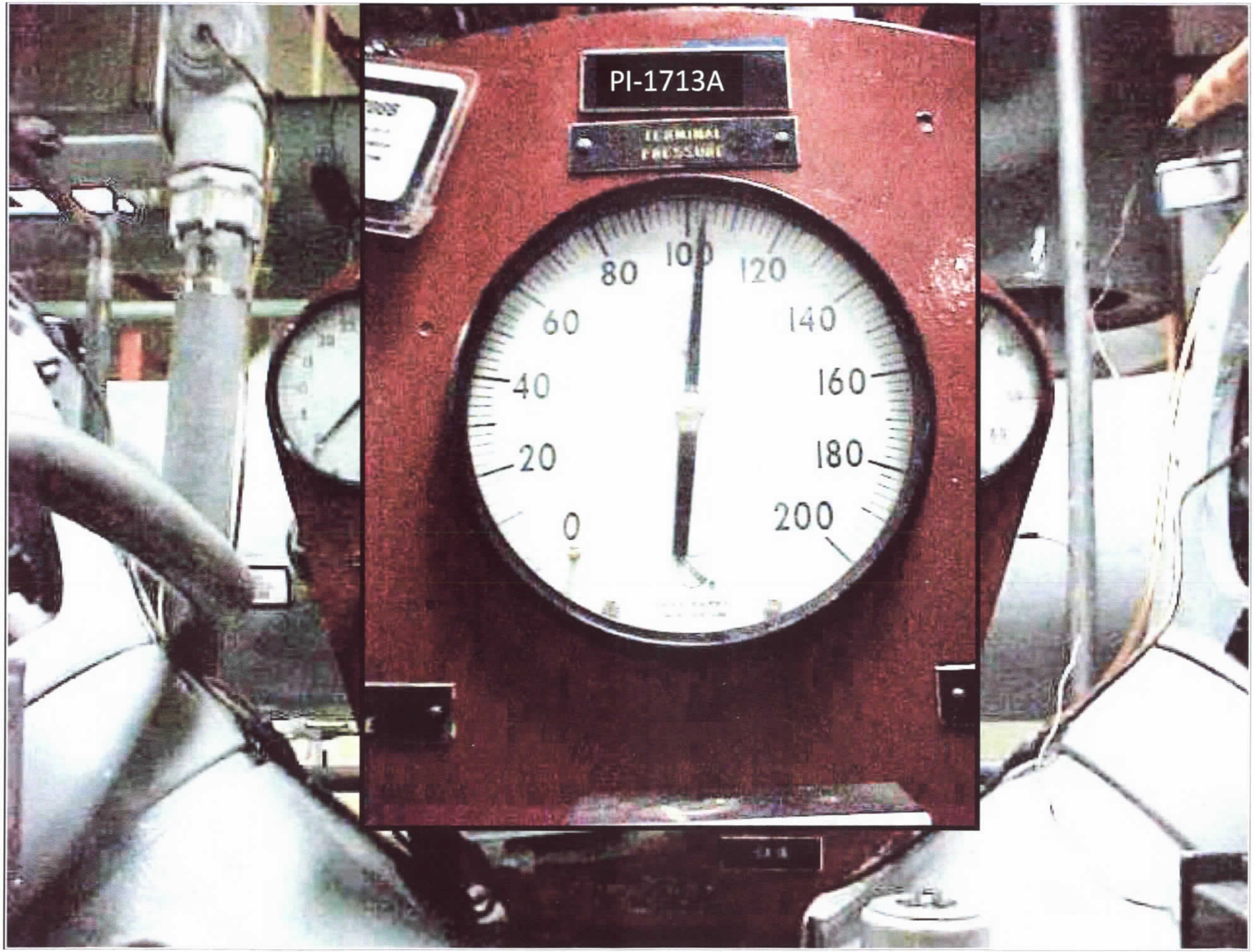
STEP	ELEMENT	STANDARD
15.a.	3) Throttle open **BOTH** of the following (Room 19): • AC-1043, "AIR COMPRESSOR CA-1A POTABLE WATER OUTLET VALVE" • AC-1045, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A POTABLE WATER OUTLET VALVE"	**(Room 19)** If needed for valves; **CUE: Valves are as you stated.** Applicant simulated throttling AC-1043. Applicant simulated throttling AC-1045. [SAT] [UNSAT]
15.a.	4) Place CA-1A, Air Compressor Control Switch, in "AFTER-START".	Applicant notified CRS to place CA-1A in "AFTER-START". After Applicant notified the CR; **CUE: CRS acknowledged. CA-1A has been placed in "AFTER-START".** [SAT] [UNSAT]
15.a	5) Locally ensure 1SS, CA-1A Control Selector Switch, is in CS.	**(Room 19)** Applicant ensured 1SS, CA-1A Control Selector Switch is in CS. After Applicant ensured the 1SS switch is in CS; **CUE: Provide Pictures and state this is what you see.** [SAT] [UNSAT]

15.a.	6) Check for flow through FI-1955A (West end of CA-1A, Air Compressor).	**(West end of CA-1A)** After Applicant located FI-1955A; **CUE: Use nonverbal cue to indicate Cooling water flow.** Applicant should notify the CRS that backup cooling to CA-1A has been established. [SAT] [UNSAT] **STOP. JPM is Finished.**

Termination Criteria: **Potable Water backup cooling is being supplied to CA-1A and it is running.**

INITIAL CONDITIONS:	• **The Plant is recovering from a Station Blackout.** • **No Air Compressor is in service.** • **Turbine Plant Cooling Water is not available.**

INITIATING CUE:	**You are an extra RO on-shift and have been directed to align Potable Water to Air Compressor, CA-1A for backup cooling in accordance with AOP-20 Step 15 so it can be started.**


PI-1713A
TERMINAL
PRESSURE
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20
40
60
80
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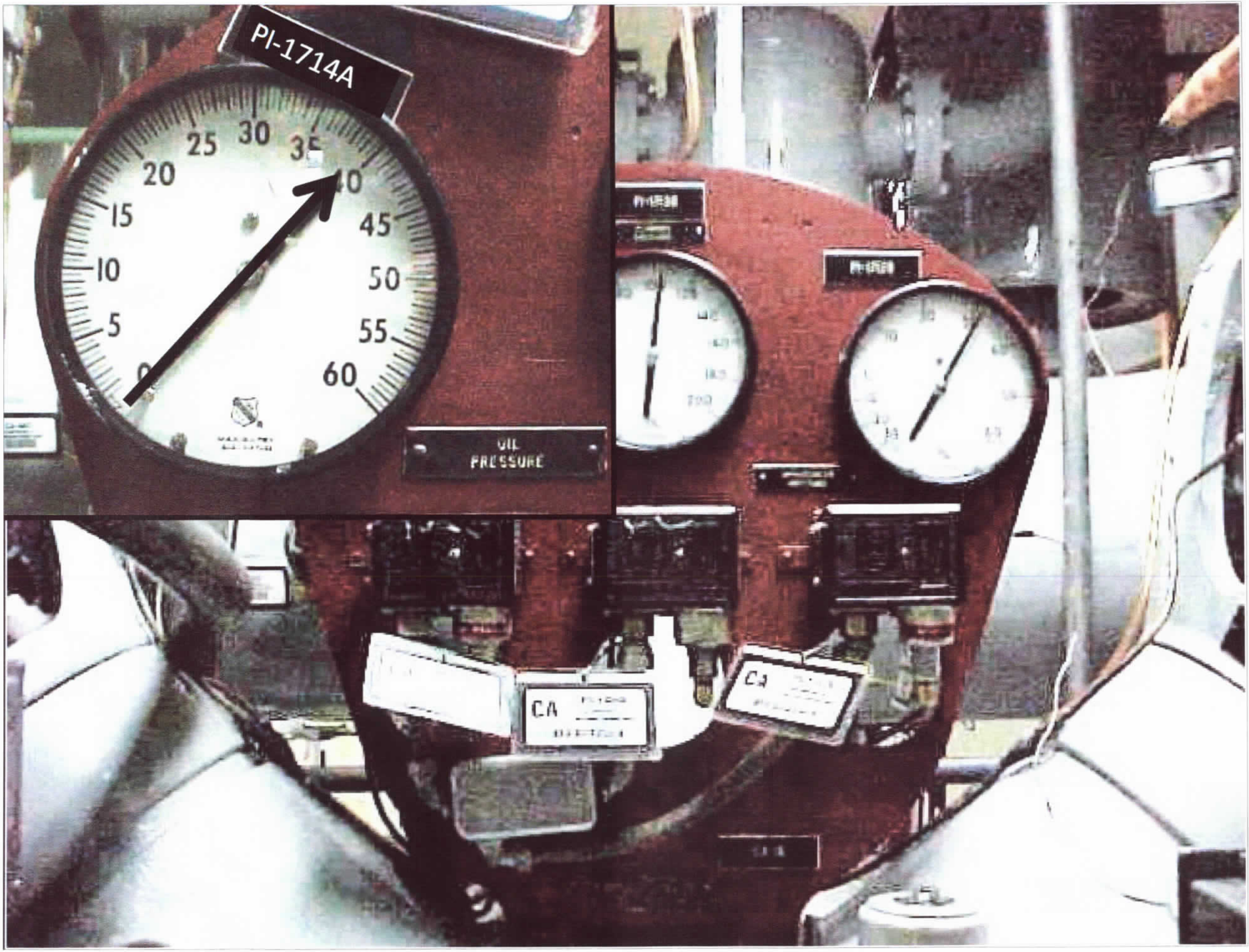

PI-1714A
OIL PRESSURE
CA
CA

INSTRUCTIONS

15. Align backup Potable Water Cooling to **ANY** or all of the Air Compressors by performing step a, b or c:

    a. Align Potable Water Cooling to CA-1A, Air Compressor, by performing the following steps:

        1) Close **ALL** of the following valves (Room 19):

            - AC-584, "AIR COMPRESSOR CA-1A INTERCOOLER INLET VALVE"
            - AC-586, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A INLET VALVE"
            - AC-588, "AIR COMPRESSOR CA-1A OUTLET VALVE"
            - AC-589, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A OUTLET VALVE"

(continue)

CONTINGENCY ACTIONS

15.1 **IF** Potable Water is **NOT** available, **THEN** IMPLEMENT AOP-17, Loss of Instrument Air.

INSTRUCTIONS | CONTINGENCY ACTIONS

15.a (continued)

2) Open **ALL** of the following valves (Room 19):

- AC-583, "AIR COMPRESSOR CA-1A INTERCOOLER INLET PRESS INDICATOR PI-1942A ROOT VALVE"
- AC-1042, "AIR COMPRESSOR CA-1A INTERCOOLER POTABLE WATER INLET VALVE"
- AC-1044, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A POTABLE WATER INLET VALVE"
- AC-1028, "COMPR COOLING WTR VALVE FCV-1990A BYPASS VALVE"

(continue)

INSTRUCTIONS CONTINGENCY ACTIONS

15.a (continued)

NOTE

Maintain 40 to 50 psig on PI-1988A for CA-1A, Air Compressor. Air Compressors will trip on low cooling water pressure at 30 psig or cooling water temperature of 130°F.

3) Throttle open **BOTH** of the following (Room 19):

- AC-1043, "AIR COMPRESSOR CA-1A POTABLE WATER OUTLET VALVE"
- AC-1045, "AIR COMPRESSOR CA-1A AFTERCOOLER CA-2A POTABLE WATER OUTLET VALVE"

4) Place CA-1A, Air Compressor Control Switch, in "AFTER-START".

5) Locally ensure 1SS, CA-1A Control Selector Switch, is in CS.

(continued)

INSTRUCTIONS | CONTINGENCY ACTIONS

15.a (continued)

6) Check for flow through FI-1955A (West end of CA-1A, Air Compressor).

b. Align Potable Water Cooling to CA-1B, Air Compressor, by performing the following steps:

1) Close **ALL** of the following valves (Room 19):

- AC-577, "AIR COMPRESSOR CA-1B INTERCOOLER INLET VALVE"
- AC-579, "AIR COMPRESSOR CA-1B AFTERCOOLER CA-2B INLET VALVE"
- AC-581, "AIR COMPRESSOR CA-1B OUTLET VALVE"
- AC-582, "AIR COMPRESSOR CA-1B AFTERCOOLER CA-2B OUTLET VALVE"

(continue)

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-3 Rev. 0

JPM Title: Perform Concentrated Boric Acid Batching

Location: Room 69

Approximate Time: 15 minutes Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): NRC K/A 004 A4.04 (RO 3.2/SRO 3.6)
Ability to manually operate and/or monitor in the control room
OI-CH-5 Attachment 1
T.S. Fig. 2-12

Handout(s): OI-CH-5 Attachment 1
T.S. Fig. 2-12

Task List #: 0144

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: _______________________________ Date: ____________

JPM Reviewed by: _______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-3 Rev. 0

JPM Title: Perform Concentrated Boric Acid Batching

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: This JPM will be performed as a static JPM.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: P-3 Rev. 0

JPM Title: Perform Concentrated Boric Acid Batching

TASK STANDARD:	**The Applicant has simulated batching boric acid to CH-11B, Boric Acid Stroage Tank.**
INITIAL CONDITIONS:	**The Contol Room has enterd EOP-3 for a Loss of Coolant Accident. Additional borated water is needed to replenish the SIRWT post RAS. EOP/AOP Attachment IC-15, Methods for Refilling The SIRWT has been entered. Flushing of the Batching Tank has been completed.**
INITIATING CUE:	**The CRS directs you to relieve the EONA and continue batching batching boric acid using a 3 and 2 bag batching rotation, starting with 3 bags to CH-11B, Boric Acid Storage Tank using OI-CH-5 Attachment 1 starting at Step 17 for additional batching required. All prerequisites have been completed.**

JPM No: P-3 Rev. 0

JPM Title: Perform Concentrated Boric Acid Batching

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
	Read CAUTIONS prior to Step 1.	Applicant may read CAUTIONS. **NOTE to Evaluator;** **Per Initiating Cue, additional batching is required. Applicant started at Step 17.** [SAT] [UNSAT]
17.	IF additional batching is required, open DW-147 and GO TO Step 4.	**(RM 69)** Applicant started at Step 17 and simulated opened DW-147. (CC) [SAT] [UNSAT]
4.	WHEN flushing is completed, THEN close the following valves: • CH-444 • CH-279	**(RM 69)** Applicant simulated closing /checking closed CH-444 and CH-279. (C) [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
5.	WHEN Batching Tank is approximately 4 inches below overflow when using 50 pound bags, 8 inches below the over flow when using 25 kilogram bags, OR desired level is reached, THEN close DW-147.	**(Rm 69)** **NOTE to Evaluator;** **Student determines tank level due to size of bags being used.** When needed' **CUE: 50lb bags are being used.** **4" below for 50lbs** 8" below for 25kgs. After Applicant determined level' **CUE: Use pointing device to indicate ~4" below tank overflow.** Applincant closed DW-147. (C) [SAT] [UNSAT]
	Applicant reads CAUTIONS prior to Step 6	Reads CAUTIONS. If needed; **CUE: You have reviewed MSDS and are adhering to FCSG-15-12.** [SAT] [UNSAT

STEP	ELEMENT	STANDARD
6.	IF Batching Tank Heaters are available, (MCC-3C2-D03, Corr 26), THEN place Boric Acid Batching Tank Heaters Control Switch in AUTO. (Room 69)	**(Room 69)** If needed; **CUE: Heater indication is as you see it.** Green light on. Applicant determined Electric Heaters are available. Applicant placed heater switch in AUTO. Applicant may notice the heaters did not coming on. If needed; **CUE: Indications are as you see them.** **If needed;** **CUE: CRS Acknowledged** [SAT] [UNSAT]
6.a	Set TIC-252, Boric Acid Batching Tank CH-12 Temperature Indicator Controller above 80°F (approximately 30°F above desired boric acid solubility temperature, per Tech Spec Figure 2-12).	Applicant verified solubility temperature per T.S. 2-12 operator aid. TIC-252 should be set to >80°F. Applicant should N/A step due to the Electric Heater not working. [SAT] [UNSAT]
7.	IF placing the Aux Steam Heating Coil in service, THEN open the following: • AS-868, Steam Trap AS-20H Inlet Drain Valve • AS-813, Aux Steam to Boric Acid Batching Tank Ch-12 Heating Coil Isolation Valve	**(RM 69)** **Alternate Path** Applicant opened AS-868. (CC) Applicant opened AS-813. (CC) [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
8.	Start CH-12-AG, Boric Acid Batching Tank Mixer.	**(RM 69)** Applicant simulated starting CH-12-AG. **If needed; CH-12-AG is running.** [SAT] [UNSAT]
	Read NOTES prior to Step 9.	Reads NOTES. [SAT] [UNSAT]
9.	WHEN the desired temperature is reached, THEN slowly add the desired number of Boric Acid Crystal bags (3 for 50 pound bags, 2 for 25 kilogram bags, or the amount directed by the Shift Manager). **[AR 15144]**	**(RM 69)** Applicant calculated required temperature using information in previous note and T.S. Figure 2-12. **Three 50lbs bags = 3.9% (~97°F)** After Applicant verified temperature requirements and indication on the temperature indicator; **CUE: Use pointing device to indicate a temperature of 97°F.** Applicant simulated adding 3 50lbs bag. [SAT] [UNSAT]
10.	WHEN Boric Acid Crystals are completely dissolved, THEN stop Batching Tank Mixer.	**CUE: Boric Acid Crystals are completely dissolved.** [SAT] [UNSAT]
11.	IF Batching Tank Heaters are energized, THEN place Heater Control Switch in OFF.	**NOTE to Evaluator;** **Heaters did not work.** **Applicant turned them off if not already done.** Step is N/A [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
12.	IF Aux Steam Coil is in service, THEN close the following: • AS-868 • AS-813	**(RM 69)** Applicant simulated closing AS-868. (C) Applicant simulated closing AS-813. (C) [SAT] [UNSAT]
13.	Unlock and Open CH-103, Boric Acid Batching Tank CH-12 Outlet Valve.	**(RM 69)** Applicant simulated unlocking and opening CH-103. (CC) Applicant may contact the Control Room. If so; **CUE: CRS Acknowledged.** [SAT] [UNSAT]
14.	Open desired Boric Acid Storage Tank Inlet valve to drain the Boric Acid Batching Tank: • CH-105, Boric Acid Storage Tank CH-11A Boric Acid Inlet Valve • CH-104, Boric Acid Storage Tank CH-11B Boric Acid Inlet Valve.	**(RM 69)** Applicant simulated opening CH-104. (CC) [SAT] [UNSAT]
17	WHEN the Boric Acid Tank is drained, THEN close the selected valve: • CH-105 • CH-104	Applicant simulated closing CH-104. (C) [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
18	Close CH-103.	Applicant simulated closing CH-103. (C) **STOP, JPM is Finished.** [SAT] [UNSAT]

Termination Criteria: The student has simulated batching boric acid to CH-11B, Boric Acid Stroage Tank.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

INITIAL CONDITIONS:	**The Contol Room has enterd EOP-3 for a Loss of Coolant Accident. Additional borated water is needed to replenish the SIRWT post RAS. EOP/AOP Attachment IC-15, Methods for Refilling The SIRWT has been entered. Flushing of the Batching Tank has been completed.**

INITIATING CUE:	**The CRS directs you to relieve the EONA and continue batching batching boric acid using a 3 and 2 bag batching rotation, starting with 3 bags to CH-11B, Boric Acid Storage Tank using OI-CH-5 Attachment 1 starting at Step 17 for additional batching required. All prerequisites have been completed.**

Attachment 1 - Batching Boric Acid

PREREQUISITES (✓) INITIALS

1. Procedure Revision Verification

   Revision Number R41 Date: TODAY — initials

2. Boric Acid is available in Room 69 for batching. — initials
3. Demineralized Water System is in operation for batching per OI-DW-4. — initials

NOTES
The most recently completed checklist, OI-CH-5-CL-A, with deviation maintained on file, may be used for alignment verification.

4. Concentrated Boric Acid Batching System is lined up per Checklist OI-CH-5-CL-A. — initials

PROCEDURE

CAUTIONS
1. Care must be taken to prevent foreign material from entering Batching Tank. 2. Ensure that the Boric Acid Lift is fully lowered before moving.

1. Open the following valves: (Room 69)
   - CH-279, Boric Acid Batching Tank CH-12 Outlet Drain First Isolation Vlv to Waste Disposal System ✓
   - CH-444, Boric Acid Batching Tank CH-12 Outlet Drain Second Isol Valve to Waste Disposal System ✓ — initials
2. Open DW-147, Boric Acid Batching Tank CH-12 Isolation Valve and flush CH-12, Boric Acid Batching Tank. (Room 69) — initials
3. Open DW-147, Boric Acid Batching Tank CH-12 Isolation Valve and flush CH-12, Boric Acid Batching Tank. (Room 69) — initials

Attachment 1 - Batching Boric Acid

PROCEDURE (continued) (✓) INITIALS

4. WHEN flushing is completed,
THEN close the following valves:

- CH-444 ___
- CH-279 ___ ________

5. WHEN Batching Tank is approximately 4 inches below overflow when using 50 pound bags, or 8 inches below the over flow when using 25 kilogram bags, OR required level is reached,
THEN close DW-147. ________

CAUTIONS
1. The Material Safety Data Sheet (MSDS) for the chemicals to be added must be reviewed.
2. The requirements of the FCSG-15-12, Chemical Handling & Use shall be followed.
3. The Boric Acid Batching Tank and water may be hot enough to cause burns.

6. IF Batching Tank Heaters are available, (MCC-3C2-D03, Corr 26),
THEN place Boric Acid Batching Tank Heaters Control Switch in AUTO. (Room 69)

   a. Set TIC-252, Boric Acid Batching Tank CH-12 Temperature Indicator Controller above 80°F (approximately 30°F above desired boric acid solubility temperature, per Tech Spec Figure 2-12). (Room 69) ________

7. IF placing the Aux Steam Heating Coil in service,
THEN open the following (Room 69):

- AS-868, Steam Trap AS-20H Inlet Drain Valve ___
- AS-813, Aux Steam to Boric Acid Batching Tank Ch-12 Heating Coil Isolation Valve ___ ________

8. Start CH-12-AG, Boric Acid Batching Tank Mixer. (Room 69) ________

Attachment 1 - Batching Boric Acid

PROCEDURE (continued) (✓) INITIALS

NOTES

1. 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).

2. Each 50 pound bag of boric acid added to a full batch tank raises the concentration approximately 1.3%.

3. Each 25 kilogram bag of boric acid weighs approximately 55 pounds and when added to a full batch tank raises the concentration approximately 1.43%.

4. The Shift Manager may change the amount of boric acid crystals to be added, provided water temperatures are above solubility temperature per Tech Spec Figure 2-12. **[AR 15144]**

9. WHEN the required temperature is reached,
THEN slowly add the desired number of Boric Acid Crystal bags (3 for 50 pound bags, 2 for 25 kilogram bags, or the amount directed by the Shift Manager). **[AR 15144]** ________

10. WHEN Boric Acid Crystals are completely dissolved,
THEN stop CH-12-AG, Boric Acid Batching Tank Mixer. ________

11. IF Batching Tank Heaters are energized,
THEN place Heater Control Switch in OFF. ________

12. IF Aux Steam Coil is in service,
THEN close the following:

- AS-868 ___
- AS-813 ___ ________

13. Unlock and Open CH-103, Boric Acid Batching Tank CH-12 Outlet Valve. (Room 69) ________

Attachment 1 - Batching Boric Acid

PROCEDURE (continued) (✓) INITIALS

14. Open selected Boric Acid Storage Tank Inlet Valve to drain the Boric Acid Batching Tank: (Room 69)
    - CH-105, Boric Acid Storage Tank CH-11A Boric Acid Inlet Valve ___
    - CH-104, Boric Acid Storage Tank CH-11B Boric Acid Inlet Valve ___ ________

15. WHEN the Boric Acid Tank is empty,
    THEN close the selected valve:
    - CH-105 ___
    - CH-104 ___ ________

16. Close CH-103. ________

17. IF additional batching is required, open DW-147 and GO TO Step 4. ________

18. WHEN batching is completed,
    THEN close and lock CH-103. ________

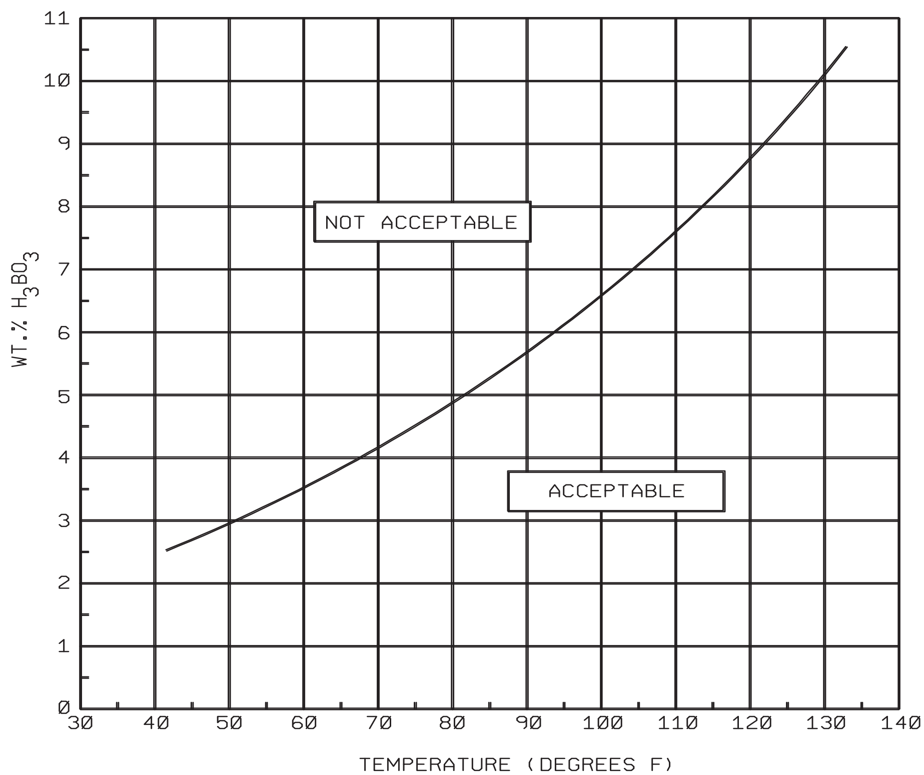
____
Ind Verif

19. Flush Boric Acid Batching Tank drain line per Attachment 12. ________

20. Close lid on Batching Tank to prevent foreign material from entering. ________

Completed by______________________________ Date/Time______/______

Figure 2-12



BORIC ACID SOLUBILITY IN WATER	OMAHA PUBLIC POWER DISTRICT FORT CALHOUN STATION-UNIT 1	FIGURE 2-12

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-1 Rev. 12

JPM Title: Emergency Boration from the Control Room (Alternate Path)

Location: Simulator

Approximate Time: 5 minutes

Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): K/A 004, A2.14 Emergency Boration (RO 3.8/SRO 3.9)
Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43/5 / 45/3 / 45/5)

AOP-03

Handout(s): AOP-03 Emergency Boration

Task List #: 0008

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: ______________________________ Date: ____________

JPM Reviewed by: ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-1 Rev. 12

JPM Title: Emergency Boration from the Control Room (Alternate Path)

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: None

Simulator Setup

INSERT: malfunction to keep HCV-268, 265, 258 closed.					
Type	**Filter**	**Item**	**Value**	**Ramp**	**Delay**
VLV	CVC	CVC_HCV268	0.0	none	none
VLV	CVC	CVC_HCV265	0.0	none	none
VLV	CVC	CVC_HCV258	0.0	none	none
Pending: Dilution Event					

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-1 Rev. 12

JPM Title: Emergency Boration from the Control Room (Alternate Path)

TASK STANDARD: **Emergency Boration has been established.**

INITIAL CONDITIONS:

- **Plant is in Mode 4.**
- **BOPO is out of the Control Room.**
- **EONA has recently placed CH-8A in service and removed CH-8B.**
- **EONA is making preparations to place the SIRWT Purification in service.**

INITIATING CUE: **You are the ATCO; perform all actions as directed by the CRS or in accordance with procedures.**

JPM No: S-1 Rev. 12

JPM Title: Emergency Boration from the Control Room (Alternate Path)

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
Note to Evaluator; **A Dilution Event will cause the Audible Count Rate Meter and the Start Up Rate on CB-4 to rise. AOP-3, Emergency Boration entry is required. The Applicant should announce that count rate is raising and enter AOP-3 to emergency borate.**		
	Applicant recognizes SUR and or the Audio Count Rate Meter is rising.	Applicant recognized that the Audio Count Rate and or the SUR is rising and made announcement. After announcement is made; **CUE: CRS Acknowledged.** [SAT] [UNSAT]
1.	Secure all positive reactivity additions in progress: • CEA withdrawals • RCS dilutions	After Applicant locates AOP-3; **CUE: Provide a copy of AOP-3 with Step 1 completed.** [SAT] [UNSAT]
2.	**IF BOTH** of the following conditions exist: • BAST level(s) greater than 10% • BAST(s) available	**(CB-1,2,3)** Applicant verified the BASTs are available. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
2.a.	Ensure both of the following are closed: • FCV-269X, Demin Water Makeup Valve • FCV-269Y, Boric Acid Makeup Valve	**(CB-4)** Applicant ensured both valves are closed. Green light on. Red light off. [SAT] [UNSAT]
2.b	Open ALL of the following valves: • HCV-268, Boric Acid Pump Header to Charging Pumps Isolation Valve • HCV-265, CH-11A Gravity Feed Valve • HCV-258, CH-11B Gravity Feed Valve	**(CB-4)** Applicant took HCV-268 control switch to Open and recognized the valve did not open. **NO Light is On.** Applicant took HCV-265 control switch to Open and recognized the valve did not open. **NO Light is On.** Applicant took HCV-258 control switch to Open and recognized the valve did not open. **NO Light is On.** Applicant recognized the valves did not open. **ALTERNATE PATH** **Note to Evaluator;** **The BAST's are not available. The Applicant may announce the valves not opening to the CRS.** If CRS is informed; **CUE: CRS Acknowledged** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
2.b.1.	**(LOCAL) IF** HCV-268 did **NOT** open, **THEN** perform the following (Corridor 26): 1) Open MCC-3C2-C02, "EMERGENCY BORATION MOV HCV-268". 2) Manually open HCV-268, "CHARGING PUMPS CH-1A, B, C EMERGENCY SUCTION HEADER STOP VALVE".	**(Local)** Applicant calls for the EONA to perform Local Actions to open MCC-3C2-CO2 and Manually open HCV-268. After Applicant calls for the EONA; **CUE: EONA does not respond.** Applicant N/A'd the remaining steps in Step 2 and proceeded to Step 3. [SAT] [UNSAT]
3.	**IF** at least **ONE** of the following conditions exist: • BAST levels are less than or equal to 10% • BASTs are **NOT** available	**(CB-1,2,3)** Applicant confirmed the BASTs are not available due to HCV-268,265 and HCV-258 did not open and the EONA is not responding. [SAT] [UNSAT]
3.a.	**THEN** align Charging Pump suction to the SIRWT by performing the following: a. Verify SIRWT has greater than 86 inches of Borated Water available.	**(AI-30A/B)** Applicant verified SIRWT is >86" water level. [SAT] [UNSAT]
3.b.	Open LCV-218-3, Charging Pump Suction SIRWT Isolation Valve.	**(CB-1,2,3)** Applicant opened LCV-218-3. Red light on. Green light off. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
3.c.	Close LCV-218-2, VCT Outlet Valve.	**(CB-1,2,3)** Applicant closed LCV-218-2. Green light on. Red light off. [SAT] [UNSAT]
3.d.	Ensure **ALL** of the following Charging Isolation Valves are open: • HCV-247 • HCV-238 • HCV-248 • HCV-239	**(CB-1,2,3)** **NOTE to Evaluator;** **These valves should have already been open.** Applicant ensured ALL of the Charging Isolation Valves are open. Red light on. Green light off. [SAT] [UNSAT]
3.e.	Start all available Charging Pumps, CH-1A/B/C.	**(CB-1,2,3)** Applicant started all available Charging Pumps. **NOTE to Evaluator;** **Unless the Applicant adjusts the Letdown bias for 3 charging pumps running, two will eventually trip on high Pzr level. One will remain running providing emergency boration.** [SAT] [UNSAT]
3.f.	Stop both Boric Acid Pumps, CH-4A/B.	**(CB-4)** Applicant stopped CH-4A/B. **NOTE to Evaluator;** **These pumps may have already been stopped or have been running in recirculation.** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
3.g.	Close **ALL** of the following valves: • HCV-268, Boric Acid Pump Header to Charging Pumps Isolation Valve • HCV-265, CH-11A Gravity Feed Valve • HCV-258, CH-11B Gravity Feed Valve	**(CB-4)** Applicant closed HCV-268, 265 and HCV-258. **NOTE to Evaluator;** **These valves may have already been closed.** **STOP, JPM is finished.** [SAT] [UNSAT]

Termination Criteria: **Emergency Boration has been established.**

INITIAL CONDITIONS:

- **Plant is in Mode 4.**
- **BOPO is out of the Control Room.**
- **EONA has recently placed CH-8A in service and removed CH-8B.**
- **EONA is making preparations to place the SIRWT Purification in service.**

INITIATING CUE: **You are the ATCO; perform all actions as directed by the CRS or in accordance with procedures.**

4.0 INSTRUCTIONS/CONTINGENCY ACTIONS

INSTRUCTIONS	CONTINGENCY ACTIONS

1. Secure all positive reactivity additions in progress:
   - CEA withdrawals
   - RCS dilutions

2. **IF BOTH** of the following conditions exist:
   - BAST level(s) greater than 10%
   - BAST(s) available

   THEN commence Emergency Boration from the Boric Acid Tanks, CH-11A/B, by performing the following:

   a. Ensure **BOTH** of the following valves are closed:
      - FCV-269X, Demin Water Makeup Valve
      - FCV-269Y, Boric Acid Makeup Valve

(continue)

INSTRUCTIONS	CONTINGENCY ACTIONS
2. (continued)	
b. Open **ALL** of the following valves: • HCV-268, Boric Acid Pump Header to Charging Pumps Isolation Valve • HCV-265, CH-11A Gravity Feed Valve • HCV-258, CH-11B Gravity Feed Valve	b.1 **(LOCAL) IF** HCV-268 did **NOT** open, **THEN** perform the following (Corridor 26): 1) Open MCC-3C2-C02, "EMERGENCY BORATION MOV HCV-268". 2) Manually open HCV-268, "CHARGING PUMPS CH-1A, B, C EMERGENCY SUCTION HEADER STOP VALVE".

(continue)

INSTRUCTIONS

2. (continued)

c. Ensure **ALL** of the following Charging Isolation Valves are open:

- HCV-247
- HCV-238
- HCV-248
- HCV-239

(continue)

CONTINGENCY ACTIONS

c.1 **IF** the Charging Header discharge is **NOT** available,
THEN perform the following:

1) Open **ALL** of the following valves to charge via the HPSI Header:

- HCV-308, Charging Pump HPSI Header Isolation Valve
- HCV-2987, HPSI Header Isolation Valve
- HCV-315, HPSI Loop Injection Valve
- HCV-318, HPSI Loop Injection Valve
- HCV-312, HPSI Loop Injection Valve
- HCV-321, HPSI Loop Injection Valve

2) Ensure the following are open:

- HCV-307, HPSI Header Isolation Valve
- HCV-306, HPSI Header Isolation Valve
- HCV-304, SI-2B and SI-2C Discharge Cross-Connect Valve
- HCV-305, SI-2A and SI-2C Discharge Cross-Connect Valve

INSTRUCTIONS

CONTINGENCY ACTIONS

2. (continued)

d. Start **ALL** of the following pumps:

1) Boric Acid Pumps, CH-4A/B

2) Charging Pumps, CH-1A/B/C

e. Close LCV-218-2, VCT Outlet Valve.

f. Ensure **ALL** of the following valves are closed:

- LCV-218-3, Charging Pump Suction SIRWT Isolation Valve
- HCV-257, CH-4B Recirc Valve
- HCV-264, CH-4A Recirc Valve

INSTRUCTIONS | CONTINGENCY ACTIONS

3. **IF** at least **ONE** of the following conditions exist:

- BAST levels are less than or equal to 10%
- BASTs are **NOT** available

THEN align Charging Pump suction to the SIRWT by performing the following:

a. Verify SIRWT has greater than 86 inches of Borated Water available.

b. Open LCV-218-3, Charging Pump Suction SIRWT Isolation Valve.

c. Close LCV-218-2, VCT Outlet Valve.

(continue)

INSTRUCTIONS

3. (continued)

d. Ensure **ALL** of the following Charging Isolation Valves are open:

- HCV-247
- HCV-238
- HCV-248
- HCV-239

(continue)

CONTINGENCY ACTIONS

d.1 **IF** the Charging Header discharge is **NOT** available,
THEN perform the following:

1) Open **ALL** of the following valves to charge via the HPSI Header:

- HCV-308, Charging Pump HPSI Header Isolation Valve
- HCV-2987, HPSI Header Isolation Valve
- HCV-315, HPSI Loop Injection Valve
- HCV-318, HPSI Loop Injection Valve
- HCV-312, HPSI Loop Injection Valve
- HCV-321, HPSI Loop Injection Valve

2) Ensure the following are open:

- HCV-307, HPSI Header Isolation Valve
- HCV-306, HPSI Header Isolation Valve
- HCV-304, SI-2B and SI-2C Discharge Cross-Connect Valve
- HCV-305, SI-2A and SI-2C Discharge Cross-Connect Valve

INSTRUCTIONS	CONTINGENCY ACTIONS
3. (continued)	
e. Start all available Charging Pumps, CH-1A/B/C.	
f. Stop both Boric Acid Pumps, CH-4A/B.	
g. Close **ALL** of the following valves: • HCV-268, Boric Acid Pump Header to Charging Pumps Isolation Valve • HCV-265, CH-11A Gravity Feed Valve • HCV-258, CH-11B Gravity Feed Valve	g.1 **(LOCAL) IF** opened locally, **THEN** manually close HCV-268, "CHARGING PUMPS CH-1A, B, C EMERGENCY SUCTION HEADER STOP VALVE" (Corridor 26).

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-2 Rev 3

JPM Title: Establish Charging Flow via the HPSI Header

Location: Simulator

Approximate Time: 12 minutes Start Time:________________

End Time:________________

Actual Time: ________________

Reference(s): K/A# 004 A4.08 Charging (RO 3.8/SRO 3.4)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

AOP-33, Attachment B, "CHARGING FROM THE HPSI HEADER."

Handout(s): AOP-33, Attachment B, "CHARGING FROM THE HPSI HEADER."

Task List #: MTL 1390

Applicable Position(s)

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ________________________ Date: __________

JPM Approved by ________________________ Date: __________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-2 Rev 3

JPM Title: Establish Charging Flow via the HPSI Header

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: None

Simulator Setup: Charging and Letdown is secured. All charging pumps are in PTL. HCV-238, 239, 240 and HCV-249 are all closed. CH-194 is closed.

INSERT: CH-194 closed. Requires charging to the HPSI header.					
Type	**Filter**	**Item**	**Value**	**Ramp**	**Delay**
Rem	CVC	REM_CVC_CH194	0	none	none

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-2 Rev 3

JPM Title: Establish Charging Flow via the HPSI Header

TASK STANDARD:	**Charging flow to the RCS using the Loop 2A High Pressure Safety Injection (HPSI) header has been established.**

INITIAL CONDITIONS:	**The plant is operating at full power. AOP-22, Section I was entered due to a RCS leak inside Containment. The leak was isolated by securing Charging and Letdown.**

INITIATING CUE:	**You are the ATCO and have been directed to reestablish charging pump flow via the HPSI header using HPSI loop 2A injection valve, HCV-318, per AOP-33, Attachment B.**

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
	Applicant reads NOTE prior to Step 1.	Applicant read NOTE. [SAT] [UNSAT]
1.	Ensure all Charging Pumps in PULL-TO-Lock	**(CB-1,2,3)** Applicant placed all Charging Pump Control Switches in Pull-To-Lock for CH-1A, CH-1B and CH-1C. [SAT] [UNSAT]
2.	Unlock and close CH-194, "CHARGING PUMPS CH- 1 A/B/C DISCHARGE HEADER CONTAINMENT OUTBOARD ISOLATION VALVE" (Room 13).	**(EONA action)** Applicant directed EONA to close CH-194. **CUE: EONA reports that CH-194 is closed.** [SAT] [UNSAT]
3.	Open HCV-308, Charging Pump HPSI Header Isolation Valve.	**(CB-1,2,3)** Applicant held HCV-308 Control Switch in OPEN until GREEN light goes OFF and Red light is ON, then released and allowed it to return to NORM. Applicant verified RED light ON and GREEN light OFF. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
4.	Ensure ALL of the following valves are open: • HCV-2987, HPSI Header Isolation Valve • HCV-307, HPSI Header Isolation Valve • HCV-305, SI-2A and SI-2C Discharge Cross-Connect Valve • HCV-304, SI-2B and SI-2C Discharge Cross-Connect Valve • HCV-306, HPSI Header Isolation Valve	Applicant ensured all of the following valves were open: **(AI-30A)** HCV-2987 has been opened. RED light ON / GREEN light OFF. **(AI-30B)** HCV-307 has been opened. RED light ON / GREEN light OFF. **(AI-30B)** HCV-305 has been opened. RED light ON / GREEN light OFF. **(AI-30A)** HCV-304 has been opened. RED light ON / GREEN light OFF. **(AI-30A)** HCV-306 has been opened. RED light ON / GREEN light OFF. [SAT] [UNSAT]
5.b.c.	Open HCV-318 (Loop 2A) by performing the following: 1) Rotate thumbwheel for PCV-2949, "LEAKAGE CLR SI-4C DISCH VLV CNTRLR fully clockwise to close "C".	**(AI-30A)** Applicant rotated PCV-2949 Controller fully clockwise such that needle indicated 100%. GREEN light ON / RED light OFF. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
5.b.c.	2) Place PCV-2949 "Leakage CLR SI-4C DISCHARGE VALVE CNTRLR" in "MANUAL"	**(AI-30A)** Applicant placed PCV-2949 Control Switch in "MANUAL" position. Amber light off. [SAT] [UNSAT]
5.b.c.	3) Open HCV-318, "LOOP 2A HPSI INJECTION VALVE"	**(AI-30B)** Applicant moved HCV-318 Control Switch to OPEN position. RED light ON / GREEN light OFF. **Note to Evaluator**: Applicant may also PULLOUT switch, but not required. [SAT] [UNSAT]
	Applicant reads NOTE prior to Step 6.	Applicant read NOTE. [SAT] [UNSAT]
6.	Ensure a charging pump suction source is available.	**(CB-1,2,3)** Applicant ensured LCV-218-2 was open. RED light ON and VCT level indicated on chart or indicator. **(VCT)** **OR** Applicant ensured LCV-218-3 was open. RED light ON. (SIRWT) [SAT] [UNSAT]
	Applicant reads NOTE prior to Step 7.	Applicant read NOTE. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
7	Operate any available Charging Pumps as necessary to maintain PZR level within 4% of programmed level.	**(CB-1,2,3)** Applicant started at least one charging pump, CH-1A/B/C by taking control switch out of Pull-To-Lock and taking it to AFTER-START. RED light ON. If needed; **CUE: CRS acknowledged.** Then, applicant verified normal single pump flow of ~40gpm either on HPSI flow indicators for Loop 2A or on ERF (Page 323). **Note to Evaluator;** Charging flow is difficult to see on the HPSI flow indicators. Applicant maintained PZR level within 4% of programed level. (60% ± 4%) [SAT] [UNSAT] **STOP. JPM is Finished.**

Termination Criteria: **Charging flow to the RCS using the Loop 2A High Pressure Safety Injection (HPSI) header has been established.**

INITIAL CONDITIONS:	**The plant is operating at full power. AOP-22, Section I was entered due to a RCS leak inside Containment. The leak was isolated by securing Charging and Letdown.**

INITIATING CUE:	**You are the ATCO and have been directed to reestablish charging pump flow via the HPSI header using HPSI loop 2A injection valve, HCV-318, per AOP-33, Attachment B.**

Attachment B

Charging Via the HPSI Header

INSTRUCTIONS

CONTINGENCY ACTIONS

NOTE

Charging through the HPSI Header will result in the addition of approximately 100 gallons of water at refueling boron concentration into the RCS.

1. Ensure all Charging Pumps are in "PULL-TO-LOCK".

2. Unlock and close CH-194, "CHARGING PUMPS CH-1A/B/C DISCHARGE HEADER CONTAINMENT OUTBOARD ISOLATION VALVE" (Room 13).

3. Open HCV-308, Charging Pump HPSI Header Isolation Valve.

4. Ensure **ALL** of the following valves are open:

   - HCV-2987, HPSI Header Isolation Valve
   - HCV-307, HPSI Header Isolation Valve
   - HCV-305, SI-2A and SI-2C Discharge Cross-Connect Valve
   - HCV-304, SI-2B and SI-2C Discharge Cross-Connect Valve
   - HCV-306, HPSI Header Isolation Valve

Attachment B

Charging Via the HPSI Header

INSTRUCTIONS

CONTINGENCY ACTIONS

5. Open at least **ONE** of the following HPSI Loop Injection Valves:

   a. Open HCV-312 (Loop 1B) by performing the following:

      1) Rotate thumbwheel for PCV-2909, "LEAKAGE CLR SI-4A DISCH VLV CNTRLR" fully clockwise to close "C".

      2) Place PCV-2909, "LEAKAGE CLR SI-4A DISCHARGE VALVE" in "MANUAL".

      3) Open HCV-312, "LOOP 1B HPSI INJECTION VALVE".

   b. Open HCV-315 (Loop 1A) by performing the following:

      1) Rotate thumbwheel for PCV-2929, "LEAKAGE CLR SI-4B DISCH VLV CNTRLR" fully clockwise to close "C".

(continue)

Attachment B

Charging Via the HPSI Header

INSTRUCTIONS | CONTINGENCY ACTIONS

5.b (continued)

2) Place PCV-2929, "LEAKAGE CLR SI-4B DISCHARGE VALVE" in "MANUAL".

3) Open HCV-315, "LOOP 1A HPSI INJECTION VALVE".

c. Open HCV-318 (Loop 2A) by performing the following:

1) Rotate thumbwheel for PCV-2949, "LEAKAGE CLR SI-4C DISCH VLV CNTRLR" fully clockwise to close "C".

2) Place PCV-2949, "LEAKAGE CLR SI-4C DISCHARGE VALVE" in "MANUAL".

3) Open HCV-318, "LOOP 2A HPSI INJECTION VALVE".

(continue)

Attachment B

Charging Via the HPSI Header

INSTRUCTIONS | CONTINGENCY ACTIONS

5. (continued)

d. Open HCV-321 (Loop 2B) by performing the following:

1) Rotate thumbwheel for PCV-2969, "LEAKAGE CLR SI-4D DISCH VLV CNTRLR" fully clockwise to close "C".

2) Place PCV-2969, "LEAKAGE CLR SI-4D DISCHARGE VALVE" in "MANUAL".

3) Open HCV-321, "LOOP 2B HPSI INJECTION VALVE".

NOTE

Using the SIRWT as a suction source will inject water with refueling boron concentration into the RCS.

6. Ensure a charging pump suction source is available.

Attachment B

Charging Via the HPSI Header

INSTRUCTIONS		CONTINGENCY ACTIONS

NOTE

Charging flow can be verified on the associated HPSI flow indicator(s) for the HPSI Loop Valve(s) in use, or on ERF (Page 323).

7. Operate any available Charging Pumps as necessary to maintain PZR level within 4% of programmed level.

8. **IF** Charging Header repairs are possible with the Plant in its current operating mode,
THEN direct Maintenance to repair leak.

8.1 **IF** Charging Header repairs are **NOT** possible with the Plant in its current operating mode,
THEN place the Plant in desired mode PER **ONE** of the following procedures:

- AOP-05, Emergency Shutdown
- OP-4, Load Change and Normal Power Operations

9. **WHEN** the Charging Header has been repaired,
THEN return the CVCS to normal operation PER OI-CH-1, Startup of Charging and Letdown.

Attachment B

Charging Via the HPSI Header

INSTRUCTIONS | CONTINGENCY ACTIONS

10. **WHEN** the CVCS has been returned to normal,
THEN IMPLEMENT Attachment E, HPSI Piping Flush, to flush all safety injection piping used in this procedure.

11. **WHEN** HPSI piping flush is completed,
THEN GO TO Section 5.0, Exit Conditions.

End of Attachment B

Attachment C

Charging Via the HPSI Header Using Only CH-1C

INSTRUCTIONS

CONTINGENCY ACTIONS

NOTE

Charging flow can be verified on the associated HPSI flow indicator(s) for the HPSI Loop Valve(s) in use, or on ERF (Page 323).

1. Ensure all Charging Pumps are in "PULL-TO-LOCK".

2. Unlock and close **BOTH** of the following valves:

   - CH-194, "CHARGING PUMPS CH-1A/B/C DISCHARGE HEADER CONTAINMENT OUTBOARD ISOLATION VALVE" (Room 13)

   - CH-191, "CHARGING PUMPS CH-1A & B DISCHARGE HEADER TO SAFETY INJECTION ISOLATION VLV." (Charging Pump Valve Room)

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-3 Rev 0

JPM Title: Reduce RCS Pressure using Auxiliary Spray (Alternate Path)

Location: Simulator

Approximate Time: 10 minutes

Start Time:__________________

End Time:___________________

Actual Time: _________________

Reference(s): K/A# 010 A4.01 PZR spray valve (RO 3.7/SRO 3.5)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
EOP/AOP Attachment PC-11
EOP/AOP Attachment PC-12
OI-RC-7 Attachment 3

Handout(s): EOP/AOP Attachment PC-11

Task List #: MTL 0626

Applicable Position(s)

Time Critical: NO

Alternate Path: YES

JPM Prepared by: ______________________________ Date: ___________

JPM Approved by ______________________________ Date: ___________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-3 Rev 0

JPM Title: Reduce RCS Pressure using Auxiliary Spray (Alternate Path)

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: None

Simulator Setup: PC-103X is OOS. Pressurizer Spray Valves PCV-103-1 and PCV-103-2 are failed closed.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-3 Rev 0

JPM Title: Reduce RCS Pressure using Auxiliary Spray (Alternate Path)

TASK STANDARD:	**RCS Pressure Control using Auxiliary Spray has been established.**
INITIAL CONDITIONS:	**The Control Room has entered EOP-3, Loss of Coolant Accident for a Small Break LOCA. Prior to the accident, PC-103X was removed from service for required maintenance.**
INITIATING CUE:	**The CRS has arrived at Step 23.b. of EOP-03 and directed you, the ATCO to maintain RCS pressure 1650 to 1850psia per EOP/AOP Attachment PC-11.**

Critical Steps shown in gray

<table>
<tr><th>STEP</th><th>ELEMENT</th><th>STANDARD</th></tr>
<tr><td colspan="3"><u>NOTE to Evaluator;</u>

PCV-103-1 and PCV-103-2 are failed closed and will not open. The Applicant will attempt to lower RCS pressure to the band of 1650 to 1850psia per the Initiating Cue either in AUTOMATIC or MANUAL. If Automatic is chosen, the Applicant will go to Manual. Because of the valves not opening, the Applicant will have to go to Contingency Action 1.1b to use Auxiliary Spray to reduce RCS pressure.</td></tr>
<tr><td></td><td>Applicant reads CAUTION prior to Step 1.</td><td>Applicant read CAUTION.

NOTE to Evaluator;
If the Applicant isolates the charging path the JPM is failed.

[SAT] [UNSAT]</td></tr>
<tr><td>1.</td><td>Maintain RCS pressure PER Attachment PC-12, RCS Pressure-Temperature Limits, by performing any of the following:

a. Automatically control Pressurizer pressure PER OI-RC-7, Reactor Coolant System Pressure Control Normal Operation.</td><td>NOTE to Evaluator;
Attachment PC-12 directs the use of OI-RC-7. OI-RC-7 directs adjusting the pressure controller's setpoint to lower pressure. When the Applicant performs adjusting the setpoint it will be noticed the Pzr Spray valves are not responding.

If Applicant gets OI-RC-7;
CUE: Provide copy to Applicant.

Applicant adjusted the setpoint on PC-103Y and noticed Pressurizer Spray is not responding .

If needed;
CRS Acknowledged.

[SAT] [UNSAT]</td></tr>
</table>

STEP	ELEMENT	STANDARD
1.cont.	b. Manually control Pressurizer pressure by performing the following	Applicant determined and continued to MANUAL Pressurizer Pressure control. [SAT] [UNSAT]
1.b.1)	Ensure selected Pressurizer Pressure Controller is in "MANUAL": • PC-103X • PC-103Y	**(CB-1.2.3)** PC-103X is out of service. Applicant ensured PC-103Y in MANUAL. **ALTERNATE PATH** **NOTE to Evaluator;** PCV-103-1 and PCV-103-2 are failed closed. [SAT] [UNSAT]
1.b.2)	Ensure Proportion Heaters Control Switches are in "AUTO": • 75 KW Proportional Htrs Bank P1 Group 6 • 75 KW Proportional Htrs Bank P2 Group 7	**(CB-1.2.3)** Applicant ensured Proportion Heaters are in AUTO. [SAT] [UNSAT]
1.b.3)	**IF** raising RCS Pressure, **THEN** adjust the selected Pressurizer Pressure Controller left: • PC-103X • PC-103Y	Applicant N/Ad step. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
1.b.4)	**IF** lowering RCS pressure, **THEN** adjust the selected Pressurizer Pressure Controller right: • PC-103X • PC-103Y	**(CB-1.2.3)** PC-103X is out of service. Applicant attempted to manually reduce RCS pressure to the band and determined both PCV-103-1 and PCV-103-2 are not opening. If needed; **CUE: CRS acknowledged** Applicant transitioned to Contingency Actions 1.1b. [SAT] [UNSAT]
	<u>Contingency Actions</u>	
1.1b	Depressurize the RCS using Aux Spray by operating the following valves as necessary: • HCV-240, PZR Auxiliary Spray Isolation Valve • HCV-249, PZR Auxiliary Spray Isolation Valve • HCV-238, Loop 1 Charging Isolation Valve • HCV-239, Loop 2 Charging Isolation Valve	Applicant reduced and stabilized RCS pressure to within 1650 to 1850 psia utilizing Auxiliary Spray and Charging Isolation Valves as necessary. **NOTE to Evaluator;** **If the Applicant isolates the charging pump flow path anytime during this evolution, the JPM is failed. Refer to NOTE at the beginning of procedure.** [SAT] [UNSAT] **STOP. JPM is Finished.**

Termination Criteria: **RCS Pressure Control using Auxiliary Spray has been established.**

INITIAL CONDITIONS:	**The Control Room has entered EOP-3, Loss of Coolant Accident for a Small Break LOCA. Prior to the accident, PC-103X was removed from service for required maintenance.**

INITIATING CUE:	**The CRS has arrived at Step 23.b. of EOP-03 and directed you, the ATCO to maintain RCS pressure 1650 to 1850psia per EOP/AOP Attachment PC-11.**

Attachment PC-11

Pressure Control

INSTRUCTIONS — CONTINGENCY ACTIONS

****

CAUTION

A charging header flow path must be maintained at all times.

****

1. Maintain RCS pressure PER Attachment PC-12, RCS Pressure-Temperature Limits, by performing any of the following:

   a. Automatically control Pressurizer pressure PER OI-RC-7, Reactor Coolant System Pressure Control Normal Operation.

   b. Manually control Pressurizer pressure by performing the following:

      1) Ensure selected Pressurizer Pressure Controller is in "MANUAL":

         - PC-103X
         - PC-103Y

      (continue)

NOTE

During an Uncontrolled Cooling event, if the P-T limits are exceeded, the Appendix E Curve provides guidance until P-T limits are restored.

1.1 **IF** RCS pressure-temperature exceeds the limits of Attachment PC-12, RCS Pressure-Temperature Limits, as indicated by **ANY** of the following:

- Uncontrolled cooldown rate of greater than 100°F per hour
- RCS pressure-temperature is above the P-T Curve limits

THEN restore the RCS to within the P-T limits by performing the following:

(continue)

Attachment PC-11

Pressure Control

INSTRUCTIONS

1.b. (continued)

2) Ensure Proportion Heaters Control Switches are in "AUTO":

- 75 KW Proportional Htrs Bank P1 Group 6
- 75 KW Proportional Htrs Bank P2 Group 7

3) **IF** raising RCS Pressure, **THEN** adjust the selected Pressurizer Pressure Controller left:

- PC-103X
- PC-103Y

4) **IF** lowering RCS pressure, **THEN** adjust the selected Pressurizer Pressure Controller right:

- PC-103X
- PC-103Y

(continue)

CONTINGENCY ACTIONS

1.1 (continued)

a. Depressurize the RCS by performing the following:

1) Ensure selected Pressurizer Pressure Controller is in "MANUAL":

- PC-103X
- PC-103Y

2) Adjust the selected Pressurizer Pressure Controller right:

- PC-103X
- PC-103Y

(continue)

Attachment PC-11

Pressure Control

INSTRUCTIONS

1. (continued)

c. **IF** SIAS has initiated **AND** pressurizer heaters are required, **THEN** perform the following:

1) Place **ALL** Backup Heater control switches in "OFF":

- "225 KW BACKUP HTRS BANK 1 GROUP 1/2/3"
- "150 KW BACKUP HTRS BANK 2 GROUP 4/5"
- "150 KW BACKUP HTRS BANK 3 GROUP 8/9"
- "225 KW BACKUP HTRS BANK 4 GROUP 10/11/12"

(continue)

CONTINGENCY ACTIONS

1.1 (continued)

b. Depressurize the RCS using Aux Spray by operating the following valves as necessary:

- HCV-240, PZR Auxiliary Spray Isolation Valve
- HCV-249, PZR Auxiliary Spray Isolation Valve
- HCV-238, Loop 1 Charging Isolation Valve
- HCV-239, Loop 2 Charging Isolation Valve

c. **IF** HPSI stop and throttle criteria are met, **THEN** control Pressurizer level using **ANY** or all of the following:

- Charging
- Letdown
- HPSI flow

PER Attachment IC-11, Inventory Control.

(continue)

Attachment PC-11

Pressure Control

INSTRUCTIONS

1.c. (continued)

2) Place selected Heater Control Switch(es) to "ON".

3) Verify small "top hat" light is "ON" for selected Heaters.

d. Manually control Pressurizer Heaters as necessary.

e. Control Aux Spray as necessary by operating the following valves:

- HCV-240, PZR Auxiliary Spray Isolation Valve
- HCV-249, PZR Auxiliary Spray Isolation Valve
- HCV-238, Loop 1 Charging Isolation Valve
- HCV-239, Loop 2 Charging Isolation Valve

(continue)

CONTINGENCY ACTIONS

1.1 (continued)

d. Stabilize RCS temperature PER Attachment HR-12, Secondary Heat Removal Operation.

e. IMPLEMENT Attachment PC-13, P-T Limit Restoration.

Attachment PC-11

Pressure Control

INSTRUCTIONS | CONTINGENCY ACTIONS

1. (continued)

f. **IF** HPSI stop and throttle criteria are met,
THEN control Pressurizer level using **ANY** or all of the following:

- Charging
- Letdown
- HPSI flow

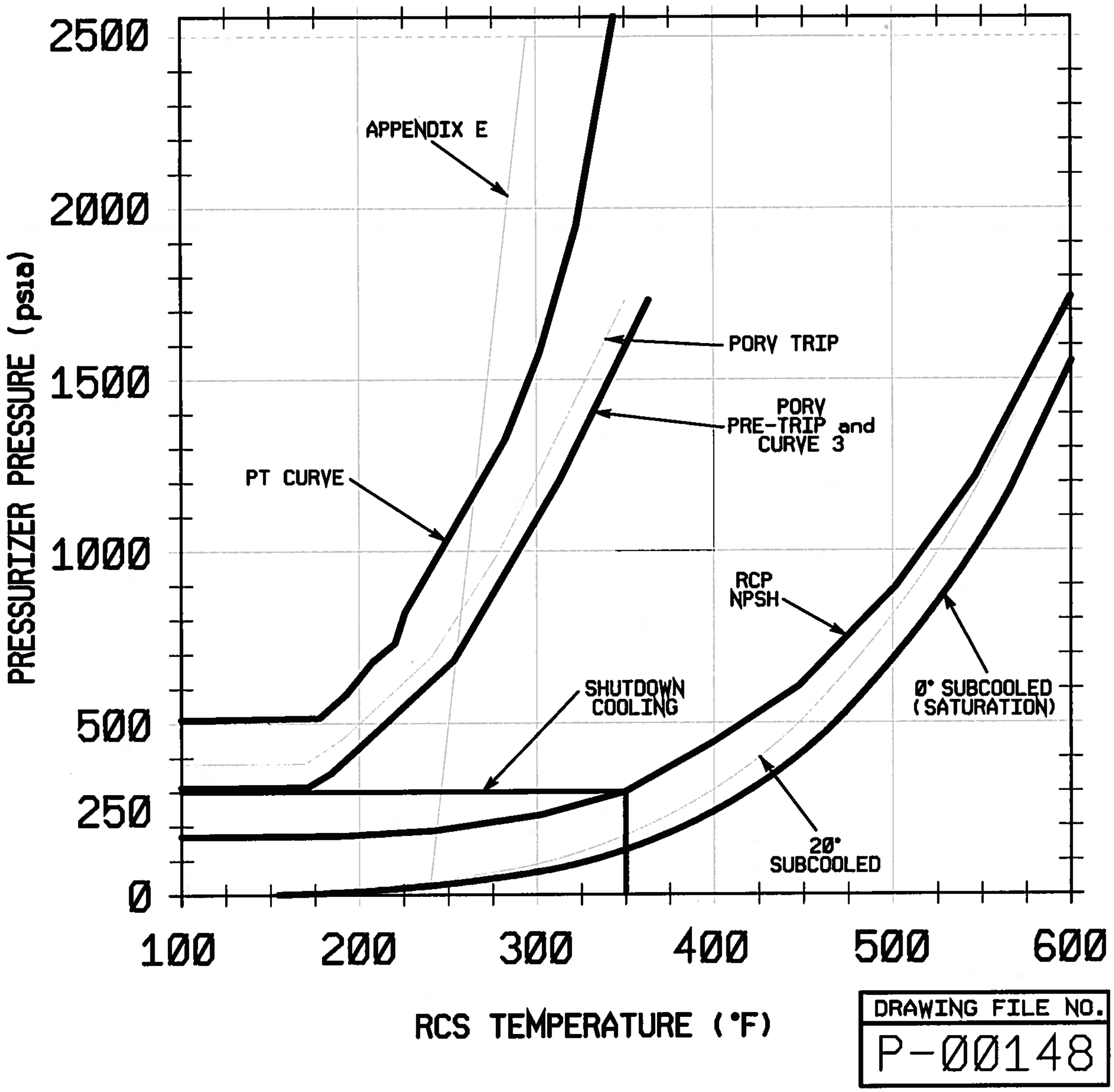
PER Attachment IC-11, Inventory Control.

g. Control RCS heat removal PER Attachment HR-12, Secondary Heat Removal Operation.

End of Attachment PC-11

Attachment PC-12

RCS Pressure-Temperature Limits



NOTES

1. During forced circulation, use T_H for the 20° F subcooled curve and saturation curve. During natural circulation, use CETs for the 20° F subcooled curve and the saturation curve. Use T_C for all other curves.

2. Curve 3 is the Maximum Pressure for First Start RCP curve.

Attachment PC-12

RCS Pressure-Temperature Limits

RCS TEMPERATURE (°F)	MINIMUM PRESSURE TO MEET RCP NPSH (psia)
64	171
95	170
145	171
195	176
245	191
295	225
300	232
345	289
395	428
445	597
495	850
545	1207
595	1697

End of Attachment PC-12

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-4 Rev 0

JPM Title: Rotation of Shutdown Cooling Pumps (Alternate Path)

Location: Simulator

Approximate Time: 10 minutes Start Time:________________

End Time:________________

Actual Time: ________________

Reference(s): K/A# 005 A4.01 Residual Heat Removal System (RO 3.6/SRO 3.4)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
OI-SC-2 Attachment 3
ARP CB-1,2,3/A2

Handout(s): OI-SC-2 Attachment 3

Task List #: MTL 1021

Applicable Position(s)

Time Critical: NO

Alternate Path: YES

JPM Prepared by: ______________________________ Date: __________

JPM Approved by ______________________________ Date: __________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-4 Rev 0

JPM Title: Rotation of Shutdown Cooling Pumps (Alternate Path)

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: None

Simulator Setup:

Simulator is in Mode 4. Scenario 2014 ILT JPM S4 has to be inserted from the JPM flash drive.

Keys needed to be inserted: # 84, 85, 86, 87, 88, 46, 47, 48, 49, 24, 25 and 8 Zero Mode Bypass Keys.

JPM No: S-4 Rev 0

JPM Title: Rotation of Shutdown Cooling Pumps

TASK STANDARD:	**SI-1B is rotated on and SI-1A is rotated off. FCV-326 adjusted in MANUAL or Loop Injections valves have been throttled to maintain required Shutdown cooling flow.**

INITIAL CONDITIONS:	**The plant is Mode 4 for a normal refueling outage. All required systems are operating normally.**

INITIATING CUE:	**You are the ATCO and have been directed to rotate SI-1B, Shutdown Cooling Pump on and SI-1A, Shutdown Cooling Pump off while maintaining 1500gpm Shutdown Cooling flow per OI-SC-2 Attachment 3. Report when pump rotation is complete and Shutdown Cooling flow is 1500gpm. The Prerequisites and Pre-Job brief have been completed.**

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Place FCV-326, Shutdown CLG HT EXCHS AC-4A & 4B LPSI Bypass Flow Control Valve, in MANUAL (CB-1,2,3).	**(CB-1,2,3)** Applicant placed FCV-326 Flow Control Valve in MANUAL. [SAT] [UNSAT]
	Applicant reads the NOTE prior to Step 2.	Applicant read NOTE. [SAT] [UNSAT]
2.	Start the desired LPSI Pump: (AI-30B) • SI-1A, Low Pressure Safety Injection Pump • SI-1B, Low Pressure Safety Injection Pump	**(AI-30B)** Applicant started SI-1B. Red light on. Green light off. [SAT] [UNSAT]
3.	WHEN satisfactory pump operation has been verified, THEN stop the off going LPSI Pump: • SI-1A • SI-1B	**(AI-30A)** Applicant stopped SI-1A Green light on. Red light off. [SAT] [UNSAT]

<u>Alternate Path</u>

FCV-326 Flow Transmitter and FCV-326 will fail closed when FIC-326 is switched to AUTOMATIC after pump rotation causing Annunciator D-2U, SHUTDOWN COOLING FLOW HI-LO, of CB-1,2,3/A2 to alarm due to low flow conditions. Due to the limiter on FCV-326, SDC flow will be ~ 700 to 900 gpm. FIC-326 has to be returned to Manual to adjust SDC flow to 1500gpm.

STEP	ELEMENT	STANDARD
4.	IF desired, THEN place FCV-326 in AUTOMATIC AND verify 1500 gpm flow is maintained.	**(CB-1,2,3)** If needed; **CUE: CRS acknowledged.** Applicant placed FCV-326 in AUTOMATIC. **NOTE to Evaluator;** **When Applicant places the Controller for FCV-326 in AUTOMATIC the valve will fail closed requiring the Applicant to return the controller to MANUAL to restore flow to 1500 gpm.** Applicant noticed FIC-326 and FCV-326 failed closed. If needed; **CUE: CRS Acknowledged.** [SAT] [UNSAT]
	Applicant responds to CB-1/2/3 D-2U, SHUTDOWN COOLING FLOW HI-LO Alarm and transition to ARP CB-1/2/3 D-2U for guidance.	**ALTERNATE PATH** Applicant responded to Annunciator CB-1,2,3/A-2 D-2U, SHUTDOWN COOLING FLOW HI-LO Alarm. Applicant recognized the valve has failed closed and made report to the CRS. If needed; **CUE: CRS acknowledged.** [SAT] [UNSAT]

ARP-CB-1,2,3/A2

STEP	ELEMENT	STANDARD
	Applicant reads NOTE.	Applicant read NOTE. [SAT] [UNSAT]
1	Check Shutdown Cooling flow on FIC-326.	**(CB-1,2,3)** Applicant checked Shutdown Cooling flow on FIC-326 and determined flow was low. **NOTE to Evaluator; SFLPSI (ERF point) = ~700 – 900 gpm.** [SAT] [UNSAT]
2.	IF Shutdown Cooling flow is low, THEN:	**(CB-1,2,3or SFLPSI)** Applicant verified flow is low. [SAT] [UNSAT]
2.1	Check for proper operation of Shutdown Cooling Pump(s).	**(AI-30A/B)** Applicant verified pump is operating properly. SI-1B = Red light on. Green light off. Amps are normal. If need; **CUE: EONA reports the pump is operating properly.** [SAT] [UNSAT]
2.2	Check position of FCV-326 and HCV-341/347/348.	**(CB-1,2,3)** Applicant noticed that FCV-326 and FIC-326 controller are in AUTO and closed. HCV-341/347/348 are verified open. Red light on. Green light off. If report is made or if needed; **CUE: CRS acknowledged.** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
2.3	Restore proper valve lineup and/or restore pump operation.	**(CB-1,2,3)** Applicant switched FIC-326 switched FIC-326 back to MANUAL to get FCV-326 to go back open. [SAT] [UNSAT]
2.4	Monitor cooling/heatup rate and adjust flow for proper rate.	**(CB-1,2,3)** **NOTE to Evaluator;** **When FIC-326 is switched back to MANUAL, the valve will go all the way open.** Applicant adjusted flow to 1500gpm manually. If needed; **CRS Acknowledged.** [SAT] [UNSAT] **STOP. JPM is Finished.**

Termination Criteria: **SI-1B is rotated on and SI-1A is rotated off. FCV-326 adjusted in MANUAL or Loop Injections valves have been throttled to maintain required Shutdown cooling flow.**

INITIAL CONDITIONS:	**The plant is Mode 4 for a normal refueling outage. All required systems are operating normally.**

INITIATING CUE:	**You are the ATCO and have been directed to rotate SI-1B, Shutdown Cooling Pump on and SI-1A, Shutdown Cooling Pump off while maintaining 1500gpm Shutdown Cooling flow per OI-SC-2 Attachment 3. Report when pump rotation is complete and Shutdown Cooling flow is 1500gpm. The Prerequisites and Pre-Job brief have been completed.**

Attachment 3 – Rotation of Shutdown Cooling Pumps

PREREQUISITES

(✓) INITIALS

1. Procedure Revision Verification

   Revision No. 30 Date: TODAY DB

2. The Shutdown Cooling System is in operation per OI-SC-1. DS

3. Ensure LPSI pump to be started is aligned for operation per OI-SC-1. DB

PROCEDURE

1. Place FCV-326, Shutdown CLG HT EXCHS AC-4A & 4B LPSI Bypass Flow Control Valve, in MANUAL (CB-1,2,3). ______

NOTE
When second Shutdown Cooling Pump is started, **SHUTDOWN COOLING FLOW HI-LO** (CB-1/2/3, A2, D-2U) alarm may annunciate.

2. Start the desired LPSI Pump: (AI-30B)

   - SI-1A, Low Pressure Safety Injection Pump __
   - SI-1B, Low Pressure Safety Injection Pump __ ______

3. WHEN satisfactory pump operation has been verified,
   THEN stop the off going LPSI Pump:

   - SI-1A __
   - SI-1B __ ______

4. IF desired,
   THEN place FCV-326 in AUTOMATIC AND verify 1500 gpm flow is maintained. ______

Completed by ______________________________ Date/Time ________/________

Panel: **CB-1/2/3**	Annunciator: **A2**	Window: **D-2U**

SHUTDOWN COOLING FLOW HI-LO

SAFETY RELATED

SHUTDOWN COOLING FLOW HI-LO

Tech Spec References: 2.1.1, 2.1.2, 2.8

Initiating Device FS-326/HC-348 in OPEN — Setpoint 1200 GPM
Initiating Device FS-326/HC-348 in OPEN — Setpoint 2000 GPM

OPERATOR ACTIONS

NOTE: No compensatory measures required if ERF point SFLPSI high and low flow alarms are set at 2000 and 1200 gpm.

1. Check Shutdown Cooling flow on FIC-326.
2. IF Shutdown Cooling flow is low, THEN:
   - 2.1 Check for proper operation of Shutdown Cooling Pump(s).
   - 2.2 Check position of FCV-326 and HCV-341/347/348.
   - 2.3 Restore proper valve lineup and/or restore pump operation.
   - 2.4 Monitor cooling/heatup rate and adjust flow for proper rate.
   - 2.5 Monitor Aux Building and Containment sumps.
   - 2.6 If Shutdown Cooling flow cannot be re-established, enter AOP-19, Loss of Shutdown Cooling.
3. IF Shutdown Cooling flow is high, THEN:
   - 3.1 Check position of FCV-326.
   - 3.2 Monitor cooling/heatup and adjust RCS flow for proper rate.

PROBABLE CAUSES

- FCV-326 failed open
- Pipe rupture
- Loss of Shutdown Cooling Pump
- Two pump operation
- Loss of Flow

REFERENCES

AOP-19 | EM-326 15318 | 136B3081 Sh 18 6242

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-5 Rev. 1

JPM Title: Raw Water leak on West Header

Location: Simulator

Approximate Time: 15 minutes

Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s):

K/A # 025, AA2.04 Loss of Residual heat Removal System (RO 3.3/SRO 3.6)
Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System:
(CFR: 43.5 / 45.13)

AOP-18

Handout(s): AOP-18

Task List #: 0785

Applicable Position(s): RO/SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ____________

JPM Reviewed by: ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-5 Rev. 1

JPM Title: Raw Water leak on West Header

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: Ensure the raw water leak is entered after the student has begun this JPM.

SIMULATOR SETUP: 100% Reactor Power, Steady State. AC-10C Raw Water Pump is running. The In-service Spent Regen Tank level is high to expedite the AI-100 Alarm when the leak is inserted. RW leak is high enough to cause the 25psig lights to go out.

INSERT:

RWSO02A is a leak on the West RW Header. Leak location is upstream of HCV-2877A.					
Type	**Filter**	**Item**	**Value**	**Ramp**	**Delay**
MALF	RWS	RWS02A	10.0	none	none

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-5 Rev. 1

JPM Title: Raw Water leak on West Header

TASK STANDARD:	**Raw water leak is isolated and Raw Water System has been restored via the east header.**

INITIAL CONDITIONS:	• **Plant is Operating at 100% Power.** • **BOPO is out of the Control Room.**

INITIATING CUE:	**You are the ATCO; perform all actions as directed by the CRS or in accordance with procedures.**

JPM No: S-5 Rev. 1

JPM Title: Raw Water leak on West Header

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
The Raw Water leak starts in the Auxiliary Building filling the In-service Spent Regen Tank causing an AI-100 alarm to annunciate. The Applicant may also notice the 25 psig indications go out on the RW headers.		
	Applicant proceeds to Step 4 of AOP-18 per direction of the CRS.	Applicant started at Step 4. [SAT] [UNSAT]
4.	**IF** Raw Water leakage is indicated in **ANY** of the following Areas: • Auxiliary Building • Intake Structure • Turbine Building • Room 19 • Room 81 **THEN** perform the following:	Applicant understood that leak was in the Auxiliary Building from the EO report and or indications and continued. [SAT] [UNSAT]

<table>
<tr><th>STEP</th><th>ELEMENT</th><th>STANDARD</th></tr>
<tr><td>4.a.</td><td>Ensure only ONE Raw Water Pump, AC-10A/B/C/D is running.</td><td>(CB-1,2,3)

Applicant ensured only ONE Raw Water Pump is running.

NOTE to Evaluator;
Applicant may request to secure ALL Raw Water Pumps per CONTINGENCY ACTION Step 4.a.1. If so, grant permission per CUE.

If requested;
CUE: Secure ALL Raw Water Pumps.

Applicant secured all RW pumps by placing all RW pumps in PTL.

[SAT] [UNSAT]</td></tr>
<tr><td>4.b.</td><td>IMPLEMENT Attachment C, Equipment Isolation.</td><td>Applicant transitioned to AOP-18 Attachment C.

[SAT] [UNSAT]</td></tr>
<tr><td colspan="3">AOP-18 Attachment C</td></tr>
<tr><td>1.</td><td>IF the leak is on the Raw Water System, THEN GO TO Step 8.</td><td>Applicant may contact the EO to determine the location of the leak or use Control Room indications.

If the EO is asked;
CUE: EO reports there is a cracked weld on the upstream side of HCV-2877A.

Applicant determined the leak is located on the Raw Water System and proceeds to Step 8.

[SAT] [UNSAT]</td></tr>
</table>

STEP	ELEMENT	STANDARD
	Applicant reads NOTE prior to Step 8.	Applicant read NOTE. [SAT] [UNSAT]
8.	**IF** leak is on **ANY** of the following: • WEST RW header • AC-12A, Raw Water Strainer • AC-1C, RW Heat Exchanger **THEN** isolate header by performing the following:	**NOTE to Evaluator;** **Applicant may contact the EO to determine the location of the leak or use Control Room indications.** If the EO is asked; **CUE: EO reports there is a cracked weld on the upstream side of HCV-2877A.** Applicant determined the leak is on the WEST RW header. [SAT] [UNSAT]
8.a.	Place AC-10A, Raw Water Pump, in "PULL-TO-LOCK".	**(CB-1,2,3)** Applicant placed AC-10A in PULL-TO-LOCK. Both light off. [SAT] [UNSAT]
8.b.	Close **ALL** of the following Raw Water Header Isolation Valves: • HCV-2874A/B • HCV-2893 • HCV-2877A/B • HCV-2882 A/B	**(CB-1,2,3)** Applicant closed the listed RW header isolation valves. Green lights on. Red lights off. [SAT] [UNSAT]
8.c.	**(LOCAL)** Close RW-144, "RAW WATER STRAINER AC-12A BACKWASH VALVE HCV-2805A OUTLET ISOLATION VALVE" (RW Vault).	**(Raw Water Vault)** After EO is contacted; **CUE: RW-144 is closed.** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
8.d.	**IF** leak is isolated, **THEN** ensure at least one Raw Water Pump, AC-10B/C/D is restored to service.	Applicant may contact EO to verify the leak has stopped. If EO is contacted; **CUE: The leak has stopped.** **NOTE to Evaluator;** **Applicant may communicate the leak is isolated prior to starting RW pumps, if RW pumps were all stopped.** If needed; **CUE: CRS acknowledges.** Applicant ensured at least one RW Pump, AC-10B, C or D. **STOP, JPM is finished.** [SAT] [UNSAT]

Termination Criteria: **Raw water leak is isolated and Raw Water System has been restored via the east header.**

INITIAL CONDITIONS:	• **Plant is Operating at 100% Power.** • **BOPO is out of the Control Room.**

INITIATING CUE: **You are the ATCO; perform all actions as directed by the CRS or in accordance with procedures.**

Fort Calhoun Station
Unit No. 1

AOP-18

LOSS OF RAW WATER

Change No.	EC 60796, 60326
Reason for Change	Human Factors review. Remove CCW feed and bleed. Add Intake flood mitigation detail.
Requestor	D. Pier
Preparer	A. Peters
Editorial Correction (a) EC 62784	Page 5
Editorial Correction (b) EC 62884	Page 9
Issue Date	01-07-14 3:00 pm

TABLE OF CONTENTS

1.0 PURPOSE

This procedure provides guidance in the event of a complete loss of Raw Water.

2.0 ENTRY CONDITIONS

Plant conditions indicate that a loss of RW has occurred. Any one or more of the following indications may be present:

A. Plant flooding is indicated from or affecting the Raw Water System.

B. RW Pump Room water level is rising.

C. Both RW header flow indicators are abnormal.

D. Pressure indicating lights are out.

E. All RW pump motor amps indicate zero.

F. Lowering RW supply header pressure.

G. CCW Pump discharge temperature is rising.

H. RW/CCW Heat Exchanger outlet temperature is rising.

3.0 PRECAUTIONS

The following specific cautions and notes apply prior to or throughout this procedure.

A. CAUTIONS

None

B. NOTES

None

4.0 INSTRUCTIONS/CONTINGENCY ACTIONS

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Ensure at least one RW Pump is operating.	1.1 **IF** RW Pumps will **NOT** operate, **THEN** GO TO Step 10.
2. **IF** a RW System rupture is indicated by **ANY** or all of the following: • East RW Header Flow FIC-2890 High or Low • West RW Header Flow FIC-2891 High or Low • RW Pump(s) Current High • RW System Pressure PIC-2892 Low • RW Pump Room Water Level LIC-2889/LC-2825 High Level **THEN** direct all available operators to identify the location of system leakage.	2.1 **IF BOTH** of the following conditions exist: • No rupture is indicated • System blockage is indicated **THEN** GO TO Step 10.

INSTRUCTIONS | CONTINGENCY ACTIONS

NOTE

Several Systems in the Intake Structure can cause leakage into the Raw Water Vault.

3. **IF** indications of Raw Water vault flooding is indicated by **ANY** of the following:

   - RW Pump Room Water Level LIC-2889 High
   - Alarm "RAW WATER PUMP ROOM HI LEVEL" (CB-1,2,3 A2/D-6U)
   - Alarm "RAW WATER PUMP ROOM HI LEVEL" (CB-1,2,3 A2/D-6L)

   THEN perform the following:

   a. Direct an Operator to Raw Water Vault to investigate.

   b. IMPLEMENT Attachment C, Equipment Isolation.

   c. **IF** Raw Water Vault level exceeds 30 inches (LIC-2889), **THEN** stop **ALL** of the RW Pumps, AC-10A/B/C/D.

INSTRUCTIONS | CONTINGENCY ACTIONS

4. **IF** Raw Water leakage is indicated in **ANY** of the following Areas:

- Auxiliary Building
- Intake Structure
- Turbine Building
- Room 19
- Room 81

THEN perform the following:

a. Ensure only **ONE** Raw Water Pump, AC-10A/B/C/D is running.

a.1 **IF** required, **THEN** secure **ALL** Raw Water Pumps, AC-10A/B/C/D.

b. IMPLEMENT Attachment C, Equipment Isolation.

5. Verify CCW temperature is less than or equal to 110°F.

5.1 **IF** CCW temperature is greater than 110°F, **THEN** GO TO Step 10.

6. IMPLEMENT the Emergency Plan.

Attachment C

Equipment Isolation

INSTRUCTIONS | CONTINGENCY ACTIONS

1. **IF** the leak is on the Raw Water System, **THEN** GO TO Step 8.

NOTE

SO-G-103, Fire Protection Operability and Surveillance Requirements, contains requirements for fire protection system.

2. **IF** leak is on the Fire Pump(s) **OR** piping, **THEN** secure both Fire Pumps, FP-1A/B by performing the following:

   a. Place **BOTH** of the following to "PULL-TO-LOCK":

      - FP-1A, Electric Fire Pump
      - FP-1B, Diesel Fire Pump

   b. **(LOCAL)** Place FP-1B Diesel Fire Pump local switch, HC/FP-1B-MS, in "OFF" (Intake, AI-183).

   c. Secure FP-5, "JOCKEY FIRE PUMP", by pushing "STOP" pushbutton. (Turbine 994' East)

(continue)

Attachment C

Equipment Isolation

INSTRUCTIONS

2. (continued)

d. Ensure FP-154, "SCREEN WASH HEADER TO FIRE PROTECTION SYSTEM CROSS-TIE VALVE" is closed (RW Vault).

e. **IF** leak was on FP-1A, **THEN** unlock and close **BOTH** of the following valves (Intake):

- FP-500, "MOTOR PMP MAIN HDR VALVE FP-151 BYPASS VALVE"
- FP-151, "MOTOR FIRE PUMP FP-1A MAIN HEADER STOP VALVE"

CONTINGENCY ACTIONS

e.1 **IF** Fire System pipe leak is **NOT** isolated, **THEN** unlock and close **BOTH** of the following Fire Loop isolation valves. (Outside Service Building):

- FP-146, "EAST HEADER STOP VALVE
- FP-145, "EAST HEADER STOP VALVE"

(continue)

Attachment C

Equipment Isolation

INSTRUCTIONS	CONTINGENCY ACTIONS
2. (continued)	
f. **IF** leak was on FP-1B, **THEN** unlock and close **BOTH** of the following valves (Intake): • FP-502, "ENGINE PMP MAIN HDR VALVE FP-153 BYPASS VALVE" • FP-153, "ENGINE FIRE PUMP FP-1B MAIN HEADER STOP VALVE"	f.1 **IF** Fire System pipe leak is **NOT** isolated, **THEN** unlock and close **BOTH** of the following Fire Loop isolation valves. (Outside Service Building): • FP-119, "NORTH HEADER STOP VALVE" • FP-147, "EAST HEADER STOP VALVE"
g. **(LOCAL) IF** the leak is on the FP-4N or FP-4P, Hose Cabinet piping, **THEN** close FP-118, "INTAKE STRUCTURE HOSE CABINET STOP VALVE" (Outside Service Building).	

Attachment C

Equipment Isolation

INSTRUCTIONS	CONTINGENCY ACTIONS

3. **IF** isolation is completed
   AND the Fire System can be restored,
   THEN restore the Fire System to service
   PER OI-FP-1, Fire Protection System
   Water System.

4. **IF** leak is on the Screen Wash System
   piping,
   THEN secure both Screen Wash Pumps,
   CW-3A/B by performing the following:

   a. Place **ALL** of the following to
      "PULL-TO-LOCK" (AI-120):

      - HC-1902A, "CW-3A, SCREEN WASH PUMP"
      - HC-1902B, "CW-3B, SCREEN WASH PUMP"
      - HC-1902C, "CW-4A, SEAL WATER PUMP"
      - HC-1902D, "CW-4B, SEAL WATER PUMP"

(continue)

Attachment C

Equipment Isolation

INSTRUCTIONS | CONTINGENCY ACTIONS

4. (continued)

b. Close **ALL** of the following valves (Intake):

- CW-412, "FIRE PUMP FP-1B & RW PUMP AC-10D SPARGING HEADER ISOLATION VALVE"
- CW-136, "SCREEN WASH STRAINER CW-7 BACKWASH PRESS CNTR VLV PCV-1912 INLET ISOLATION VALVE "
- CW-131, "FLUSHING WATER HEADER STOP VALVE"
- CW-135, "SCREEN WASH STRAINER CW-7 BACKWASH PRESS CNTR VLV PCV-1912 BYPASS VALVE"
- SW-108, "SCREEN WASH STRAINER CW-7 SERVICE WATER FLUSH ISOLATION VALVE"
- CW-253, "FIRE PUMP FP-1A SPARGER CIRC WATER SUPPLY VALVE"

(continue)

Attachment C

Equipment Isolation

INSTRUCTIONS	CONTINGENCY ACTIONS

4.b (continued)

- CW-312, "RAW WATER PUMP AC-10A SPARGER ISOLATION VALVE"
- CW-130, "SCREEN WASH PUMP CW-3B DISCHARGE VALVE"
- CW-127, "SCREEN WASH PUMP CW-3A DISCHARGE VALVE"

5. **IF** leak is on any Spray Wash Header, **THEN** place the affected pump Control switch to "OFF":

- "CW-2A-PMP-HC, ON-OFF SWITCH" (AI-340A)
- "CW-2B-PMP-HC, ON-OFF SWITCH" (AI-340B)
- "CW-2C-PMP-HC, ON-OFF SWITCH" (AI-340C)
- "CW-2D-PMP-HC, ON-OFF SWITCH" (AI-340D)
- "CW-2E-PMP-HC, ON-OFF SWITCH" (AI-340E)
- "CW-2F-PMP-HC, ON-OFF SWITCH" (AI-340F)

Attachment C

Equipment Isolation

INSTRUCTIONS	CONTINGENCY ACTIONS
6. **IF** leak is on the Auxiliary Steam System, **THEN** isolate AS-138, "UNIT HEATERS VA-164A-164D STEAM SUPPLY HEADER ISOLATION VALVE" (Intake).	6.1 **IF** Auxiliary Steam Leak is **NOT** isolated, **THEN** close AS-1487, "TURB BLDG AUX STEAM HEADER ISOLATION VALVE" (Turbine Building).

Attachment C

Equipment Isolation

INSTRUCTIONS	CONTINGENCY ACTIONS

7. **IF** the leak is on the Raw Water pump seal water line,
   THEN perform the following:

   a. Isolate seal water for affected pump (RW Vault):

      - AC-10A
        SW-236, "RAW WATER PUMP AC-10A SEAL WATER SUPPLY ISOLATION VALVE"
      - AC-10B
        SW-237, "RAW WATER PUMP AC-10B SEAL WATER SUPPLY ISOLATION VALVE"
      - AC-10C
        SW-238, "RAW WATER PUMP AC-10C SEAL WATER SUPPLY ISOLATION VALVE"
      - AC-10D
        SW-239, "RAW WATER PUMP AC-10D SEAL WATER SUPPLY ISOLATION VALVE"

   b. Verify running Raw Water Pump seal flow is greater than 0.2 gpm (RW Vault).

7.1 **IF** Raw Water Pump seal leak is **NOT** isolated,
   THEN perform the following:

   a. Close SW-227, "RAW WATER PUMPS AC-10A-10D SEAL WATER SUPPLY ISOLATION VALVE" (Intake, CW bay).

   b. Verify running Raw Water Pump seal flow is greater than 0.2 gpm (RW Vault).

Attachment C

Equipment Isolation

INSTRUCTIONS

CONTINGENCY ACTIONS

NOTE

The leak isolation Steps 8 through 15 may be performed in any logical order.

8. **IF** leak is on **ANY** of the following:

- WEST RW header
- AC-12A, Raw Water Strainer
- AC-1C, RW Heat Exchanger

THEN isolate header by performing the following:

a. Place AC-10A, Raw Water Pump, in "PULL-TO-LOCK".

b. Close **ALL** of the following Raw Water Header Isolation Valves:

- HCV-2874A/B
- HCV-2893
- HCV-2877A/B
- HCV-2882 A/B

(continue)

8.1 **IF** leak was **NOT** isolated, **THEN** restore the RW section to service by performing the following:

a. Open any or **ALL** of the following Raw Water Header Isolation Valves:

- HCV-2874A/B
- HCV-2893
- HCV-2877A/B
- HCV-2882A/B

b. **IF** required, **THEN** start an available Raw Water Pump, AC-10A/B/C/D.

Attachment C

Equipment Isolation

INSTRUCTIONS | CONTINGENCY ACTIONS

8. (continued)

c. **(LOCAL)** Close RW-144, "RAW WATER STRAINER AC-12A BACKWASH VALVE HCV-2805A OUTLET ISOLATION VALVE" (RW Vault).

d. **IF** leak is isolated,
THEN ensure at least one Raw Water Pump, AC-10B/C/D is restored to service.

Attachment C

Equipment Isolation

INSTRUCTIONS

9. **IF** leak is on **ANY** of the following:

- EAST RW header
- AC-12B, Raw Water Strainer
- AC-1D, RW Heat Exchanger

THEN isolate header by performing the following:

a. Place AC-10D, Raw Water Pump, in "PULL-TO-LOCK".

b. Close **ALL** of the following Raw Water Header Isolation Valves:

- HCV-2876A/B
- HCV-2894
- HCV-2879A/B
- HCV-2883A/B

(continue)

CONTINGENCY ACTIONS

9.1 **IF** leak was **NOT** isolated, **THEN** restore the RW section to service by performing the following:

a. Open any or **ALL** of the following Raw Water Header Isolation Valves:

- HCV-2876A/B,
- HCV-2894
- HCV-2879A/B
- HCV-2883A/B

b. **IF** required, **THEN** start an available Raw Water Pump, AC-10A/B/C/D.

Attachment C

Equipment Isolation

INSTRUCTIONS | CONTINGENCY ACTIONS

9. (continued)

c. **(LOCAL)** Close RW-145, "RAW WATER STRAINER AC-12B BACKWASH VALVE HCV-2805B OUTLET ISOLATION VALVE" (RW Vault).

d. **IF** leak is isolated,
THEN ensure at least one Raw Water Pump, AC-10A/B/C is restored to service.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-6 Rev 1

JPM Title: Operate Containment Hydrogen Analyzer

Location: Simulator

Approximate Time: 10 minutes

Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): K/A# 028 A1.01Hydrogen concentration (RO 3.4/SRO 3.8)
Ability to predict and/or monitor changes in parameter (to prevent exceeding design limits) associated with operating the HRPS controls including: Hydrogen concentration
(CFR: 41.5 / 45.5)

EOP-3 Loss of Coolant Accident
EOP/AOP Attachment CI-12
EOP/AOP Floating Step R
OI-VA-6

Handout(s): EOP/AOP Attachment CI-12
EOP/AOP Floating Step R
OI-VA-6

Task List #: MTL 0156

Applicable Position(s) RO/SRO

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ______________________________ Date: ____________

JPM Approved by ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-6 Rev 1

JPM Title: Operate Containment Hydrogen Analyzer

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: None

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-6 Rev 1

JPM Title: Operate Containment Hydrogen Analyzer

TASK STANDARD:	**Hydrogen Analyzer has been placed in service and hydrogen concentration has been determined.**

INITIAL CONDITIONS:	**The plant was operating at 100% power when a loss of coolant accident occurred inside Containment. The Reactor tripped and EOP-00, Standard Post Trip Actions were performed. Per Diagnostics, EOP-3, Loss of Coolant Accident was entered by the CRS.**

INITIATING CUE:	**The CRS has directed you, the ATCO to perform EOP/AOP Floating Step R using the highest sample point and report when completed.**

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
	EOP/AOP Floating Step R	
	Applicant reads NOTE prior to Step 1 of EOP/AOP Floating Steps R. Containment Hydrogen.	Applicant read NOTE. [SAT] [UNSAT]
1.	**WHEN** a high energy line break has occurred in the Containment, **THEN** monitor Containment Hydrogen concentration using at least one Hydrogen Analyzer, VA-81A/B.	**(AI-65A/B)** Applicant verified that neither Hydrogen Analyzer is operating and transitioned to the Contingency Action 1.1. [SAT] [UNSAT]
1.1	**IF** neither Hydrogen Analyzer is operating, **THEN** REFER TO Attachment CI-12, Containment Hydrogen Analyzer Startup.	Applicant transitioned to EOP/AOP Attachment CI-12. [SAT] [UNSAT]
	EOP/AOP Attachment CI-12	
1.	Start the Hydrogen Analyzers, by performing the following:	Applicant starts with Step 1of Attachment CI-12. [SAT] [UNSAT]
1.a.	Open **ONE** of the Containment Hydrogen Sampling Valves, HCV- 820 C/D/E/F/G/H.	**(AI-65A/B) (HVC-820C)** Applicant opened **ONE** of the Hydrogen Sampling Valves, HCV- 820 C. Red light on, Green light off for the Open Valve. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
1.b.	Open **ONE** of the Containment Hydrogen Sampling Valves, HCV-883C/D/E/F/G/H.	**(AI-65A/B) (HCV-883C)** Applicant opened **ONE** of the Containment Hydrogen Sampling Valves, HCV-883 C Red light on, Green light off for the Open Valve. [SAT] [UNSAT]
1.c.	Place **ALL** of the following switches in "O'RIDE": • "H2 ANALYZER VA-81A ISOLATION VALVES OUTBD HCV-820A/821A" • "H2 ANALYZER VA-81B ISOLATION VALVES INBD HCV-883A/884A" • "H2 ANALYZER VA-81A ISOLATION VALVES INBD HCV-820B/821B" • "H2 ANALYZER VA-81B ISOLATION VALVES OUTBD HCV-883B/884B"	**(AI-65A/B)** Applicant placed ALL the listed switches in "O'RIDE". [SAT] [UNSAT]
1.d.	Place the Hydrogen Analyzer Recorders, HR-81A/B, in service by turning **BOTH** power switches to "ON".	**(AI-65A/B)** **NOTE to Evaluator; Both recorders are maintained on.** Applicant verified Hydrogen Analyzer Recorders, HR-81A/B and in service. Lights/recorders on. [SAT] [UNSAT]

<table>
<tr><th>STEP</th><th>ELEMENT</th><th>STANDARD</th></tr>
<tr><td>1.e.</td><td>Ensure the Hydrogen Analyzer Dual Range Selector Switches are in "0-10%".</td><td>(AI-65A/B)

Applicant ensured the Hydrogen Analyzer Dual Range Selector Switches are in "0-10%".

[SAT] [UNSAT]</td></tr>
<tr><td>1.f.</td><td>Place the Hydrogen Analyzer Power On Selector Switches in "ANALYZE".</td><td>(AI-65A/B)

Applicant placed the Hydrogen Analyzer Power On Selector Switches in "ANALYZE".

[SAT] [UNSAT]</td></tr>
<tr><td>1.g.</td><td>Ensure the Function Selector Switches are in "SAMPLE".</td><td>(AI-65A/B)

Applicant ensured the Function Selector Switches are in "SAMPLE".

[SAT] [UNSAT]</td></tr>
<tr><td>1.h.</td><td>Press the "REMOTE" selector push buttons.</td><td>(AI-65A/B)

Applicant pressed the "REMOTE" selector push buttons.

[SAT] [UNSAT]</td></tr>
<tr><td>1.i.</td><td>Check the following indications:
The "CONTAINMENT H2 SAMPLING SYSTEM REMOTE/LOCAL OFF NORMAL" annunciator (A65A and B, Window 32) are "IN ALARM"
H2 0-10% Range Amber indicating lights are "ON"
The Sample indicating lights are "ON"</td><td>(AI-65A/B)

Applicant checked annunciator A65A and B, Window 32 are “IN ALARM”.

Alarms are in.

Applicant checked H2 0-10% Range Amber indicating lights are ON. Lights are on.

Applicant checked the Sample indicating lights are ON.

[SAT] [UNSAT]</td></tr>
</table>

STEP	ELEMENT	STANDARD
1.j.	Press the "ALARM RESET" push buttons.	**(AI-65A/B)** Applicant pressed the ALARM RESET push buttons. [SAT] [UNSAT]
1.k	**WHEN** 5 minutes has elapsed since pressing the "ALARM RESET" push buttons, **THEN** valid hydrogen concentrations may be read.	**(AI-65A/B)** **After a short pause,** **CUE: 5 minutes has elapsed.** **NOTE to Evaluator;** **Applicant may read H2 concentration at this time. H2 concentration is 3.0%.** If reported to the CRS; **CUE: CRS acknowledged.** Applicant continued to EOP/AOP Floating Step R. **STOP. JPM is Finished.** [SAT] [UNSAT]

Termination Criteria: **Hydrogen Analyzer has been placed in service and hydrogen concentration has been determined.**

INITIAL CONDITIONS:	**The plant was operating at 100% power when a loss of coolant accident occurred inside Containment. The Reactor tripped and EOP-00, Standard Post Trip Actions were performed. Per Diagnostics, EOP-3, Loss of Coolant Accident was entered by the CRS.**

INITIATING CUE:	**The CRS has directed you, the ATCO to perform EOP/AOP Floating Step R and report when completed.**

2.0 FLOATING STEPS

R. CONTAINMENT HYDROGEN

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

High Containment humidity will cause indicated hydrogen concentration to read higher than the actual concentration.

1. **WHEN** a high energy line break has occurred in the Containment, **THEN** monitor Containment Hydrogen concentration using at least one Hydrogen Analyzer, VA-81A/B.	1.1 **IF** neither Hydrogen Analyzer is operating, **THEN** REFER TO Attachment CI-12, Containment Hydrogen Analyzer Startup.
2. **IF** Containment dewpoint is equal to Containment temperature, **THEN** REFER TO OI-VA-6, Containment Hydrogen Analyzer Operation, to compensate for humidity.	

2.0 FLOATING STEPS

R. CONTAINMENT HYDROGEN

INSTRUCTIONS	CONTINGENCY ACTIONS
3. Verify Containment hydrogen concentration is less than 0.5%.	3.1 **IF** Containment hydrogen concentration is greater than 3.0% **AND** the Site Director has directed a Containment purge, **THEN** guidance will be provided by the Technical Support Center for hydrogen purge.

Attachment CI-12

Containment Hydrogen Analyzer Startup

INSTRUCTIONS | CONTINGENCY ACTIONS

1. Start the Hydrogen Analyzers, by performing the following:

   a. Open **ONE** of the Containment Hydrogen Sampling Valves, HCV-820C/D/E/F/G/H.

   b. Open **ONE** of the Containment Hydrogen Sampling Valves, HCV-883C/D/E/F/G/H.

   c. Place **ALL** of the following switches in "O'RIDE":

      - "H2 ANALYZER VA-81A ISOLATION VALVES OUTBD HCV-820A/821A"
      - "H2 ANALYZER VA-81B ISOLATION VALVES INBD HCV-883A/884A"
      - "H2 ANALYZER VA-81A ISOLATION VALVES INBD HCV-820B/821B"
      - "H2 ANALYZER VA-81B ISOLATION VALVES OUTBD HCV-883B/884B"

(continue)

Attachment CI-12

Containment Hydrogen Analyzer Startup

INSTRUCTIONS

CONTINGENCY ACTIONS

1. (continued)

d. Place the Hydrogen Analyzer Recorders, HR-81A/B, in service by turning **BOTH** power switches to "ON".

e. Ensure the Hydrogen Analyzer Dual Range Selector Switches are in "0-10%".

f. Place the Hydrogen Analyzer Power On Selector Switches in "ANALYZE".

g. Ensure the Function Selector Switches are in "SAMPLE".

h. Press the "REMOTE" selector push buttons.

(continue)

Attachment CI-12

Containment Hydrogen Analyzer Startup

INSTRUCTIONS	CONTINGENCY ACTIONS

1. (continued)

   i. Check the following indications:

      - The "CONTAINMENT H_2 SAMPLING SYSTEM REMOTE/LOCAL OFF NORMAL" annunciator (A65A and B, Window 32) are "IN ALARM"
      - H_2 0-10% Range Amber indicating lights are "ON"
      - The Sample indicating lights are "ON"

   j. Press the "ALARM RESET" push buttons.

   k. **WHEN** 5 minutes has elapsed since pressing the "ALARM RESET" push buttons, **THEN** valid hydrogen concentrations may be read.

End of Attachment CI-12

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-7 Rev 9

JPM Title: Restoration of Offsite Electrical Power Bus 1A4 & DG-2 (Alternate Path)

Location: Simulator

Approximate Time: 20 minutes Start Time:__________________

End Time:__________________

Actual Time: __________________

Reference(s): K/A# 064 A4.07 Emergency Diesel Generator (RO 3.8/SRO 3.4)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

AOP-32, Loss of 416 Volt or 480 Volt Bus Power
EOP-7, Station Blackout
MVA-14, Restoring Off-Site Power to Bus
MVA-16, Operation of DS-T1
ARP-CB-20/A18, Annunciator Response Procedure
OI-EE-1, Normal Operation of 4160 Volt System

Handout(s): MVA-14, Restoring Off-Site Power to Bus
MVA-16, Operation of DS-T1

Task List #: MTL 1350

Applicable Position(s) RO/SRO

Time Critical: NO

Alternate Path: YES

JPM Prepared by: ______________________________ Date: ____________

JPM Approved by ______________________________ Date: ____________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-7 Rev 9

JPM Title: Restoration of Offsite Electrical Power Bus 1A4 & DG-2 (Alternate Path)

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: Flashlights

Safety Considerations: None

Comments: None

Simulator Setup is Station Blackout with DG-1 and DG-2 supplying Bus 1A3 and Bus 1A4. Breakers 110 and 111 fail to trip upon trying to close them.

INSERT					
Type	**Filter**	**Item**	**Value**	**Ramp**	**Delay**
MALF	SWD	SWD_BKR110	Fail to Trip	none	none
MALF	RWS	SWD_BKR111	Fail to Trip	none	none

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-7 Rev 9

JPM Title: Restoration of Offsite Electrical Power Bus 1A4 & DG-2 (Alternate Path)

TASK STANDARD:	**Restored Offsite (345KV) power to Bus 1A4 due to 161KV breakers unable to be closed.**
INITIAL CONDITIONS:	**The plant was operating at 100% when a severe thunderstorm passed over the site causing a Station Black Out. EOP-7, Station Black Out was entered. Restoration of Offsite power is in progress. The Control Room has been informed by T&D Operations that 161KV and 345KV are stable and available to the Station.**
INITIATING CUE:	**You are the BOPO and have been directed to restore power to Bus 1A4 per Attachment MVA-14.**

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
1.	Verify **NONE** of the following Lockout Relays are tripped: • 86/1A24 • 86/1A44 • 86/1A4-TFB	**(CB-20 and Back of Panel)** Applicant verified all Relays are in the RESET position. Relays are in the RESET position. [SAT] [UNSAT]
2.	Ensure **BOTH** of the following breakers are tripped: • 1A24 • 1A44	**(CB-20)** Applicant Ensured both breakers are tripped. [SAT] [UNSAT]
3.	Ensure "TRANSFER SWITCH 43/1A2-1A4" is in "MANUAL".	Applicant Ensured 43/1A24-1A4 is in MANUAL. [SAT] [UNSAT]
4.	Verify **NONE** of the following Lockout Relays are tripped: • 86A/OPLS • 86B/OPLS	**(AI-30A/AI-30B)** Applicant verified 86A/86B OPLS Relays are RESET. [SAT] [UNSAT]
5.	Ensure Offsite Power is in a stable condition and expected to remain stable per T&D Operations.	Per Initial Condition the Applicant determined Offsite Power is stable and continued. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
6.	**(LOCAL) IF** Bus 1A4 is energized from DG-2, **THEN** place AI-133B-S4, "DIESEL GENERATOR DG-2 ELECTRONIC DROOP CONTROL SWITCH", in "ENABLED". (AI-133B)	**(AI-133B)** After Applicant contacts Equipment Operator; **CUE: AI-133B-S4 is in ENABLE.** [SAT] [UNSAT]
7.	**IF** 161 KV voltage is between 161 KV and 168.6 KV, **THEN** energize 1A4 by performing the following:	**(CB-20)** Applicant verified voltage is between 161 KV and 168.6 KV. [SAT] [UNSAT]
7.a.	Ensure Lockout Relay 86/161 is reset (AI-22).	**(AI-22)** Applicant ensured 86/161 is RESET. [SAT] [UNSAT]
7.b.	Ensure **ALL** of the following lockout relays are reset: • 86-1/T1A-4 (AI-25) • 86-2/T1A-4 (AI-25) • 86-1/T1A-3 (AI-24) • 86-2/T1A-3 (AI-24) • 86X/FT161 (AI-26)	**(AI-24/25/26)** Applicant ensured ALL lockout relays are reset. All relays are in the RESET position. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
ALTERNATE PATH **Breaker 110 and Breaker 111 will fail to trip position upon closing.**		
7.c.	Synchronize and close at least one of the following breakers: • Breaker 110 • Breaker 111	**(CB-20)** Applicant closed Breaker(s) 110/111 and noticed that the breaker(s) tripped. Green and White light on. Applicant informed CRS. **If needed;** **CUE: CRS Acknowledged.** [SAT] [UNSAT]
7.1.	**IF** 345 KV is available, **THEN** energize 1A4 by performing the following:	**ALTERNATE PATH** Applicant transitioned to Step 7.1 to restore 345KV to Bus 1A4. [SAT] [UNSAT]
7.1.a.	Ensure flags are matched for **BOTH** of the following Generator Output Breakers: • 3451-4 • 3451-5	**(CB-20)** Applicant ensured flags are matched. Bkr 3451-4 greened flagged. Bkr 3451-5 greened flagged. [SAT] [UNSAT]
7.1.b.	Ensure MOD DS-T1 is open PER Attachment MVA-16, Operation of DS-T1, the Main Disconnect Switch.	**(CB-20)** The Applicant transitioned to MVA-16. When MVA-16 is located; **CUE: Provide a copy of MVA-16 to Applicant.** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
EOP/AOP Attachment MVA-16		
1.	Turn the DS-T1 Kirk Key 180 degrees to satisfy the interlock on the Motor Operator (Turbine Building Mezzanine).	**(LOCAL)** Applicant contacted the EONT to insert Kirk Key and turn 180 degrees. **CUE: Kirk Key has been inserted and turned 180 degrees.** [SAT] [UNSAT]
2	Ensure **ALL** the following Generator breakers are tripped: • Generator Output Breaker 3451-4 • Generator Output Breaker 3451-5 • Generator Field Breaker 41E/G1F	**(CB-20)** Applicant ensured the breakers are tripped. [SAT] [UNSAT]
3	Ensure Turbine Stop Valves are closed.	**(CB-10/11)** Applicant ensured Turbine Stop Valves are closed. [SAT] [UNSAT]
4.	Ensure **ALL** of the following 4160 V breakers are tripped: • 1A11 • 1A13 • 1A22 • 1A24	**(CB-20)** Applicant ensured all the breakers are tripped. [SAT] [UNSAT]
5.	Check T1A-1 and T1A-2 secondaries indicate 0 volts.	**(CB-20)** Applicant checked voltages indicated 0 volts. [SAT] [UNSAT]
6.	Ensure Isolated Phase Bus	**(CB-10/11)**

STEP	ELEMENT	STANDARD
	Duct Cooling Unit is off.	Applicant ensured IPBDC unit is off [SAT] [UNSAT]
7.	**IF** electrical operation of DS-T1 is possible, **THEN** open DS-T1 (CB-20 or Turbine Building Mezzanine).	**(CB-20)** Applicant opened DS-T1 [SAT] [UNSAT]
8.	Visually inspect DS-T1 to ensure all three phases are open.	**(LOCAL)** Applicant contacted the EONT to inspect all three phases of DS-T1 are open. **CUE: All three phases are open.** [SAT] [UNSAT]
9.	Turn the DS-T1 Kirk Key 180 degrees.	**(LOCAL)** Applicant directed EONT to turn DS-T1 Kirk Key. **CUE: Kirk Key has been turned 180 degrees.** [SAT] [UNSAT]
10.	Remove the DS-T1 Kirk Key.	**(LOCAL)** Applicant directed EONT to remove the DS-T1 Kirk Key. **CUE: DS-T1 Kirk Key has been removed.** [SAT] [UNSAT]

ATTACHMENT MVA-14

STEP	ELEMENT	STANDARD
7.1.c.	Place ST-6B, Stator Cooling Pump, in "PULL-TO-LOCK".	**(CB-10/11)** Applicant placed ST-6B in PTL. [SAT] [UNSAT]
7.1.d.	Ensure **ALL** of the following lockout relays are reset: • 86-2/BF4 (AI-23) • 86-2/BF5 (AI-22) • 86-1/SVG1 (AI-22) • 86-2/SVG1 (AI-22) • 86-1/G1 (AI-21) • 86-2/G1 (AI-21) • 86-3/G1 (AI-21) • 86-1/GT1 (AI-21) • 86-2/GT1 (AI-21) • 86-3/GT1 (AI-21)	**(AI-21/22/23)** Applicant ensured ALL lockout relays are in the reset position. Relay handles are vertical. [SAT] [UNSAT]
7.1.e.	Ensure the operable Isolated Bus Duct Cooling Unit is red-flagged.	**(CB-10/11)** Applicant ensured the operable Isolated Bus Duct Cooling Unit is red flagged. [SAT] [UNSAT]
7.1.f	Synchronize and close at least one of the following Generator Output Breakers: • 3451-4 • 3451-5	**(CB-20)** Applicant synchronized and closed at least one of the following generator output breakers. [SAT] [UNSAT]
7.1.g.	Check that T1A-2 secondary voltage is greater than or equal to 4160 V.	**(CB-20)** Applicant checked secondary voltage is ≥ 4160V. [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
	Applicant reads CAUTION prior to Step 7.1.i.	Applicant read CAUTION. [SAT] [UNSAT]
7.1.i.	**IF** DG-2 is loaded on Bus 1A4, **THEN** set Diesel Generator, DG-2 Governor Droop Dial to the "SCRIBE MARK" (D-2).	**(D-2)** When EO is contacted; **CUE: DG-2 Governor Droop Dial has been set to the "SCRIBE MARK".** [SAT] [UNSAT]
7.1.j	Synchronize and close breaker 1A24.	**(CB-20)** Applicant synchronized and closed breaker 1A24. **STOP. JPM is Finished.** [SAT] [UNSAT]

Termination Criteria: **Restored Offsite (345KV) power to Bus 1A4 due to 161KV breakers unable to be closed.**

INITIAL CONDITIONS:	**The plant was operating at 100% when a severe thunderstorm passed over the site causing a Station Black Out. EOP-7, Station Black Out was entered. Restoration of Offsite power is in progress. The Control Room has been informed by T&D Operations that 161KV and 345KV is available and stable to the Station.**

INITIATING CUE:	**You are the BOPO and have been directed to restore power to Bus 1A4 per Attachment MVA-14.**

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Verify **NONE** of the following Lockout Relays are tripped: • 86/1A24 • 86/1A44 • 86/1A4-TFB	1.1 **IF** 1A4 is faulted, **THEN** Off-Site Power can **NOT** be restored to Bus 1A4.
2. Ensure **BOTH** of the following breakers are tripped: • 1A24 • 1A44	
3. Ensure "TRANSFER SWITCH 43/1A2-1A4" is in "MANUAL".	
4. Verify **NONE** of the following Lockout Relays are tripped: • 86A/OPLS • 86B/OPLS	4.1 **IF** OPLS is tripped, **THEN** reset OPLS by performing the following: a. Place "CHAN "A" TEST AND BYPASS SW TS-A/OPLS" in "BYPASS".
(continue)	(continue)

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS	CONTINGENCY ACTIONS
4. (continued)	4.1 (continued)

b. Place "CHAN "B" TEST AND BYPASS SW TS-B/OPLS" in "BYPASS".

c. Place **ALL** of the following Condenser Evacuation Pump control switches in ""PULL-TO-LOCK":

- FW-8A
- FW-8B
- FW-8C

d. Reset **BOTH** of the following lockout relays:

- 86A/OPLS
- 86B/OPLS

5. Ensure Offsite Power is in a stable condition and expected to remain stable per T&D Operations.

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS	CONTINGENCY ACTIONS
6. **(LOCAL) IF** Bus 1A4 is energized from DG-2, **THEN** place AI-133B-S4, "DIESEL GENERATOR DG-2 ELECTRONIC DROOP CONTROL SWITCH", in "ENABLED". (AI-133B)	6.1 **IF** Bus 1A4 is **NOT** energized from DG-2, **THEN** place breaker 1AD2 in "PULL-TO-LOCK".
7. **IF** 161 KV voltage is between 161 KV and 168.6 KV, **THEN** energize 1A4 by performing the following: a. Ensure Lockout Relay 86/161 is reset (AI-22). b. Ensure **ALL** of the following lockout relays are reset: • 86-1/T1A-4 (AI-25) • 86-2/T1A-4 (AI-25) • 86-1/T1A-3 (AI-24) • 86-2/T1A-3 (AI-24) • 86X/FT161 (AI-26) (continue)	7.1 **IF** 345 KV is available, **THEN** energize 1A4 by performing the following: a. Ensure flags are matched for **BOTH** of the following Generator Output Breakers: • 3451-4 • 3451-5 b. Ensure MOD DS-T1 is open PER Attachment MVA-16, Operation of DS-T1, the Main Disconnect Switch. (continue)

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS

7. (continued)

c. Synchronize and close at least one of the following breakers:

- Breaker 110
- Breaker 111

d. Check that T1A-4 secondary voltage is greater than or equal to 4160 V.

e. Verify the "TRANS T1A-4 SECONDARY LOW VOLTAGE" alarm (A18, A8) is clear.

f. Ensure **ALL** of the following lockout relays are reset (AI-25):

- 86/1A44
- 86/1A24
- 86/1A4-TFB

(continue)

CONTINGENCY ACTIONS

7.1 (continued)

c. Place ST-6B, Stator Cooling Pump, in "PULL-TO-LOCK".

d. Ensure **ALL** of the following lockout relays are reset:

- 86-2/BF4 (AI-23)
- 86-2/BF5 (AI-22)
- 86-1/SVG1 (AI-22)
- 86-2/SVG1 (AI-22)
- 86-1/G1 (AI-21)
- 86-2/G1 (AI-21)
- 86-3/G1 (AI-21)
- 86-1/GT1 (AI-21)
- 86-2/GT1 (AI-21)
- 86-3/GT1 (AI-21)

e. Ensure the operable Isolated Bus Duct Cooling Unit is red-flagged.

f. Synchronize and close at least one of the following Generator Output Breakers:

- 3451-4
- 3451-5

(continue)

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS

7. (continued)

****

CAUTION

While paralleling, rotation of the synchroscope in the "FAST" direction will result in a reduction of load on the Diesel Generator when off-site power is synchronized to the bus. Reverse power may occur if less than 300 KW is loaded onto 1A4 while synchronizing to off-site power.

****

g. **IF** Diesel is loaded on the Bus, **THEN** set Diesel Generator, DG-2 Governor Droop Dial to the "SCRIBE MARK" (DG-2).

h. Synchronize and close breaker 1A44.

i. **IF** Diesel Generator load drops below 300 KW, **THEN** open breaker 1AD2.

(continue)

CONTINGENCY ACTIONS

7.1 (continued)

g. Check that T1A-2 secondary voltage is greater than or equal to 4160 V.

h. Verify the "TRANS T1A-2 SECONDARY LOW VOLTAGE" alarm (A19, A5) is clear.

****

CAUTION

While paralleling, rotation of the synchroscope in the "FAST" direction will result in a reduction of load on the Diesel Generator when off-site power is synchronized to the bus. Reverse power may occur if less than 300 KW is loaded onto 1A4 while synchronizing to off-site power.

****

i. **IF** DG-2 is loaded on Bus 1A4, **THEN** set Diesel Generator, DG-2 Governor Droop Dial to the "SCRIBE MARK" (D-2).

(continue)

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS	CONTINGENCY ACTIONS
7. (continued)	7.1 (continued)
	j. Synchronize and close breaker 1A24.
	k. **IF** Diesel Generator load drops below 300 KW, **THEN** open breaker 1AD2.
8. **IF** OPLS was bypassed, **THEN** perform the following:	8.1 **IF** OPLS can **NOT** be restored, **THEN** perform the following:
a. Verify at least three of the following four red lights are lit: • 4.16 KV Bus 1A3 on AI-30A-S1-1 • 4.16 KV T1A-1 or 3 on AI-30A-S1-2 • 4.16 KV T1A-2 or 4 on AI-30B-S2-2 • 4.16 KV Bus 1A4 on AI-30B-S2-1	a. Open breaker 1A44 or 1A24. b. Comply with Technical Specification 2.0.1.

(continue)

Attachment MVA-14

Restoring Off-Site Power to Bus 1A4

INSTRUCTIONS	CONTINGENCY ACTIONS

8. (continued)

   b. Restore OPLS to standby by performing the following:

      1) Place "CHAN "A" TEST AND BYPASS SW TS-A/OPLS" in "NORMAL" (AI-30A-ESF).

      2) Place "CHAN "B" TEST AND BYPASS SW TS-B/OPLS" in "NORMAL" (AI-30B-ESF).

NOTE

Minimize operation of the Diesel Generator at no or light load (less than 500 KW). Low loading may allow oil accumulation in the exhaust system and air box.

9. **IF** DG-2 is running,
   THEN shutdown DG-2 PER Attachment MVA-21, Shutdown of Diesel Generator DG-2.

End of Attachment MVA-14

Attachment MVA-16

Operation of DS-T1, the Main Disconnect Switch

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Turn the DS-T1 Kirk Key 180 degrees to satisfy the interlock on the Motor Operator (Turbine Building Mezzanine).	
2. Ensure **ALL** the following Generator breakers are tripped: • Generator Output Breaker 3451-4 • Generator Output Breaker 3451-5 • Generator Field Breaker 41E/G1F	
3. Ensure Turbine Stop Valves are closed.	
4. Ensure **ALL** of the following 4160 V breakers are tripped: • 1A11 • 1A13 • 1A22 • 1A24	
5. Check T1A-1 and T1A-2 secondaries indicate 0 volts.	
6. Ensure Isolated Phase Bus Duct Cooling Unit is off.	

Attachment MVA-16

Operation of DS-T1, the Main Disconnect Switch

INSTRUCTIONS	CONTINGENCY ACTIONS
7. **IF** electrical operation of DS-T1 is possible, **THEN** open DS-T1 (CB-20 or Turbine Building Mezzanine).	7.1 **IF** electrical operation of DS-T1 is **NOT** possible, **THEN** manually open DS-T1 by performing the following (Turbine Building Mezzanine): a. Place the Manual-Electric Handle in "MANUAL". b. Insert Hand Crank. c. Open DS-T1 using the Hand Crank. d. **WHEN** DS-T1 is OPEN, **THEN** remove the Hand Crank. e. Place the Manual-Electric Control Lever in the "ELECTRIC" (Locked, Detent) position.
8. Visually inspect DS-T1 to ensure all three phases are open.	
9. Turn the DS-T1 Kirk Key 180 degrees.	

Attachment MVA-16

Operation of DS-T1, the Main Disconnect Switch

INSTRUCTIONS	CONTINGENCY ACTIONS
10. Remove the DS-T1 Kirk Key.	

End of Attachment MVA-16

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-8 Rev 0

JPM Title: Verify Radiation monitor Operation using Check Source (RM-055)

Location: Simulator

Approximate Time: 10 minutes Start Time:________________

End Time:________________

Actual Time: ________________

Reference(s): K/A# 073 A4.03 Process Radiation Monitoring (RO 3.1/SRO 3.2)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
OI-RM-1

Handout(s): OI-RM-1
TDB-IV.7

Task List #: MTL 0585

Applicable Position(s)

Time Critical: NO

Alternate Path: NO

JPM Prepared by: ____________________________ Date: __________

JPM Approved by ____________________________ Date: __________

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-8 Rev 0

JPM Title: Verify Radiation monitor Operation using Check Source (RM-055)

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: RM-055 is off to start with. This requires a key.

Fort Calhoun Station – Operations Training
JOB PERFORMANCE MEASURE

JPM No: S-8 Rev 0

JPM Title: Verify Radiation monitor Operation using Check Source (RM-055)

TASK STANDARD:	**RM-055 (Liquid Waste Disposal) has been placed in service and considered operable.**

INITIAL CONDITIONS:	**The plant is Mode 1 and all systems are operating normal. Maintenance on RM-055 has just been completed and the clearance has been removed.**

INITIATING CUE:	**The CRS has directed you, the ATCO to place RM-055 in service per OI-RM-1, Attachment 10 so Monitor Tank, WD-22B can be released. The Prerequisite and Pre-Job Brief have been completed. Inform the CRS when completed.**

Critical Steps shown in gray

STEP	ELEMENT	STANDARD
2.	IF placing RM-055 in service OR if maintenance was performed, THEN perform the following:	Applicant N/Ad Step 1 and started with Step 2. [SAT] [UNSAT]
2.a.	Ensure RM-055-1 local rate meter key switch is in on (Rm 10).	**(Rm 10)** After EO is contacted; **CUE: RM-055-1 local rate meter key switch is in on.** [SAT] [UNSAT]
2.b.	Verify RM-055 high setpoint is per TDB-IV.7.	Applicant used the scroll button to access high setpoint on RM-055. Applicant verified high setpoint on RM-055 per TDB-IV.7. **NOTE to Evaluator;** High Setpoint = 1.40E+06 [SAT] [UNSAT]
2.c.	Verify RM-055 alert setpoint is per TDB-IV.7.	Applicant used the scroll button to access alert setpoint on RM-055. Applicant verified alert setpoint on RM-055 per TDB-IV.7. **NOTE to Evaluator;** Alert Setpoint = 1.40E+05 [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
2.d.	Ensure RM-055 alert setpoint on the ERF is per TDB-IV.7.	Applicant ensured RM-055 alert setpoint on the ERF is per TDB-IV.7. **NOTE to Evaluator;** Alert Setpoint = 1.40E+05 [SAT] [UNSAT]
2.e.	Ensure RM-055 high setpoint on the ERF is per TDB-IV.7.	Applicant ensured RM-055 high setpoint on the ERF is per TDB-IV.7. **NOTE to Evaluator;** High Setpoint = 1.40E+06 [SAT] [UNSAT]
2.f.	Verify the alert and high alarms are reset.	Applicant verified alarms are reset. [SAT] [UNSAT]
2.g.	Place RM-055 Control Room rate meter key switch to ON.	Applicant placed RM-055 Control Room rate meter key switch to ON. [SAT] [UNSAT]
	Applicant reads NOTE prior to Step 2.h.	Applicant read NOTE. [SAT] [UNSAT]
2.h.	To verify operability, source check RM-055 by performing the following:	**NOTE to Evaluator;** The following steps are verifying Radiation Monitor Operation using Check Source.

STEP	ELEMENT	STANDARD
2.h.1)	Verify RM-055 Keypad Switch is in the ON position.	Applicant verified RM-055 Keypad Switch is in the ON position. [SAT] [UNSAT]
2.h.2)	Record the RM-055 background reading: ____________ cpm	Applicant recorded 1.60E+2 background counts. [SAT] [UNSAT]
	Applicant reads NOTE prior to Step 2.h.3)	Applicant reads NOTE. [SAT] [UNSAT]
2.h.3)	Momentarily depress the Check Source pushbutton and verify the meter reading raises above the background reading.	Applicant depressed the Check Source pushbutton and verified the meter reading raises above the background reading. If needed; **CUE: Counts on RR-049A rose.** [SAT] [UNSAT]
2.h.4)	WHEN the Check Source deenergizes, THEN verify the meter returns to its background reading.	Applicant verified the meter returns to its background reading. If needed; **CUE: Counts on RR-049A returned to background reading.** [SAT] [UNSAT]

STEP	ELEMENT	STANDARD
2.h.5)	IF counts fail to rise or restore to background, THEN carryout the actions of the CH-ODCM-0001, Off-Site Dose Calculation Manual, for the inoperable monitor, or terminate the effluent release.	Applicant N/Ad step and reported to the CRS that RM-055 is in service. [SAT] [UNSAT] **STOP. JPM is Finished.**

Termination Criteria: **RM-055 (Liquid Waste Disposal) has been placed in service and considered operable.**

INITIAL CONDITIONS:	**The plant is Mode 1 and all systems are operating normal. Maintenance on RM-055 has just been completed and the clearance has been removed.**

INITIATING CUE:	**The CRS has directed you, the ATCO to place RM-055 in service per OI-RM-1, Attachment 10 so, Monitor Tank, WD-22B can be released. The Prerequisite and Pre-Job Brief have been completed. Inform the CRS when completed.**

Attachment 10 - RM-055 (Liquid Waste Disposal)

PREREQUISITES (✓) INITIALS

1. Procedure Revision Verification

Revision No. 67 Date: TODAY

PROCEDURE

1. IF removing RM-055 from service,
THEN perform the following:

   a. Ensure the ODCM requirement is met. ______

   b. Place RM-055 Control Room ratemeter keyswitch to KEYPAD. ______

   c. IF desired to prevent the trip functions,
   THEN place RM-055-1 local ratemeter keyswitch to KEYPAD (Rm 10). ______

2. IF placing RM-055 in service OR if maintenance was performed,
THEN perform the following:

   a. Ensure RM-055-1 local ratemeter keyswitch is in on (Rm 10). ___

   b. Verify RM-055 high setpoint is per TDB-IV.7. ___

   c. Verify RM-055 alert setpoint is per TDB-IV.7. ___

   d. Ensure RM-055 alert setpoint on the ERF is per TDB-IV.7. ___

   e. Ensure RM-055 high setpoint on the ERF is per TDB-IV.7. ___

   f. Verify the alert and high alarms are reset. ___

   g. Place RM-055 Control Room ratemeter keyswitch to ON. ___

Attachment 10 - RM-055 (Liquid Waste Disposal)

PROCEDURE (continued) (✓) INITIALS

2.

> **NOTE**
> RM-055 is considered inoperable during the Check Source. Remaining stationed at RM-055 and ensuring RM-055 returns to normal before leaving the area administratively replaces the log entry during the Check Source.

h. To verify operability, source check RM-055 by performing the following:

1) Verify RM-055 Keypad Switch is in the ON position. ___

2) Record the RM-055 background reading:

___________ cpm ___

> **NOTE**
> The Check Source is only energized for a 2 minute period.

3) Momentarily depress the Check Source pushbutton and verify the meter reading raises above the background reading. ___

4) WHEN the Check Source deenergizes,
THEN verify the meter returns to its background reading. ___

5) IF counts fail to rise or restore to background,
THEN carryout the actions of the CH-ODCM-0001, Off-Site Dose Calculation Manual, for the inoperable monitor, or terminate the effluent release. ___

3. IF changing RM-055 alert/high setpoints,
THEN perform the following:

a. Ensure the ODCM requirements are met. **[AR 12250]** _______

b. Place RM-055 Control Room ratemeter keyswitch to KEYPAD. _______

Attachment 10 - RM-055 (Liquid Waste Disposal)

PROCEDURE (continued) (✓) INITIALS

3.

c. Notify I&C to perform the following:

1) Compare the As Found RM-055 alert setpoint with the TDB-IV.7. ___

2) Enter the TDB-IV.7 Value for RM-055 alert setpoint. ___

3) Compare the As Found RM-055 high setpoint with the TDB-IV.7. ___

4) Enter the TDB-IV.7 value for RM-055 high setpoint. ___

5) Using the Mode pushbutton verify RM-055 high setpoint is per TDB-IV.7. ___

6) Using the Mode pushbutton verify RM-055 alert setpoint is per TDB-IV.7. ___

7) Enter the TDB-IV.7 value for RM-055 alert setpoint into the ERF. ___

8) Enter the TDB-IV.7 value for RM-055 high setpoint into the ERF. ___ ________
I&C

d. Verify RM-055 high setpoint is per TDB-IV.7. ___

e. Verify RM-055 alert setpoint is per TDB-IV.7. ___

f. Ensure RM-055 alert setpoint on the ERF is per TDB-IV.7. ___

g. Ensure RM-055 high setpoint on the ERF is per TDB-IV.7. ___

h. Ensure RM-055 ratemeter high alarm is reset. ___

i. Place RM-055 Control Room ratemeter keyswitch to ON. ___ ________

Attachment 10 - RM-055 (Liquid Waste Disposal)

PROCEDURE (continued) (✓) INITIALS

4. IF flushing RM-055,
   THEN perform the following:

   a. Ensure the ODCM requirement is met. ______

      1) Ensure the following:

         A. WD-631, Monitor Tank Pumps WD-23A&B Low Flow Rate Control Inlet Valve, is closed. ___

         B. WD-632, Monitor Tank Pumps WD-23A&B Overbrd Disch Vlv HCV-692 Inlet Vlv, is closed. ___

         C. WD-1031, Rad Monitor RM-055 Sample Inlet Isolation Valve, is open. ___

         D. WD-1032, Rad Monitor RM-055 Sample Outlet Isolation Valve, is open. ___

         E. WD-624, Monitor Tank Pumps WD-23A&B Discharge Header Drain Valve, is open. ___ ______

      2) Open WD-622, Waste Discharge to Condenser Overboard Disch HDR. ___

      3) Open WD-626, Demin Water Isol, to begin flushing and observe lowering counts on RM-055. ___

      4) WHEN the Flush is no longer needed,
         THEN close WD-626. ___

      5) Close WD-622. ___ ______

Completed by ________________________________ Date/Time ______/_____

Table 1 - Process Monitor Setpoints

Channel	Description	Alert/Warn Alarm Setpoint cpm	High Alarm Setpoint cpm	Sensitivity Factor cpm/uCI/cc	Background cpm	Check Source NCPM [3]	Remarks
RM-043	LRWPB Stack (GAS)	2.48E+03	1.24E+04	2.33E+07	36	436	
RM-050	Containment (PART)	1.73E+04	5.00E+06	4.81E+06	6.44E+02		Calibrated using Xe-133 gas.
RM-051	Containment (GAS)	7.74E+04[1, 2]	5.00E+06*	2.23E+07	90		*Used in AST Design Basis
RM-052	AB Stack (GAS)	7.82E+03	3.91E+04*	2.24E+07	70	23048	*Used in AST Design Basis
RM-052	Containment (GAS)	7.77E+04[1, 2]	5.00E+06*	2.24E+07	70	23048	*Used in AST Design Basis
RM-053	Component Cooling	6.00E+03	2.94E+04	3.55E+08	1.30E+03		
RM-054A	S/G Blowdown	4.93E+03	4.93E+04	9.84E+07	96	266	Minimum 1 CW pump and a maximum blowdown of 1.29E5 lbm/hr.
RM-054B	S/G Blowdown	4.94E+03	4.94E+04	9.84E+07	2.20E+02	223	Minimum 1 CW pump and a maximum blowdown of 1.29E5 lbm/hr.
RM-055	Overboard Disch Hdr	1.40E+05	1.40E+06	1.11E+08	1.60E+02	1355	Minimum 1 CW pump
RM-055	Overboard Disch Hdr	4.00E+04	4.00E+05	1.11E+08	1.60E+02	1355	Minimum 2 RW pumps

NOTE 1: The ERFCS Alert Setpoint may vary as required per FC-212 Containment Release Permit.
NOTE 2: The Containment Gas Monitor Alert Setpoint may be set higher in the ERF Computer but must be set less than the High Alarm Setpoint. This is due to the fact that the ERF Computer receives a Raw Voltage Signal from the Radiation Monitor and may read higher than the corresponding radiation monitor. Setting the Alert Setpoint higher than this value but less than the Alarm value allows operations to have a useful Alert Alarm function.
NOTE 3: Values used for performing SE-ST-RM-0001.

Table 1 - Process Monitor Setpoints

Channel	Description	Alert/Warn Alarm Setpoint cpm	High Alarm Setpoint cpm	Sensitivity Factor cpm/uCI/cc	Background cpm	Check Source NCPM [3]	Remarks
RM-057	Condenser Off Gas	5.00E+03	1.90E+06	5.94E+08	820	7230	
RM-058	Waste Effluent	----------Out of Service----------					
RM-062	AB Stack (GAS)	6.60E+03	3.30E+04*	1.89E+07	50	504	*Used in AST Design Basis
RM-064	Post Accident Main Steam (GAS)			3.04E+01	19		Operational During S/G Tube Rupture Incident
RM-065	Post Accident Control Room (IODINE)	3.50E+05	7.00E+05	7.92E+04 [4]	80		Operational During a DBA [2]
RM-067	TSC (PING) Particulate	874	51731	6.86E+04 [1]	200		
RM-067	TSC (PING) Iodine	722	27444	4.66E+04 [1]	110		
RM-067	TSC (PING) Noble Gas	1274	4242	3.12E+07	70		

NOTE 1: Sensitivity Factor cpm/uCi.
NOTE 2: In AUTO, pump starts on VIAS actuation.
NOTE 3: Values used for performing SE-ST-RM-0001.
NOTE 4: Sensitivity Factor cpm/uCi, calculated from Eberline Specifications.

Table 2 – Effluent Monitor Values for IC AU1, IC AA1, IC AS1, and IC AG1

Monitor	Description	NOUE (IC AU1)		ALERT (IC AA1)		SAE (IC AS1)	GE (IC AG1)
		EAL 1 (2 Times High Alarm)[1]	EAL 2 Monitor Reading[2]	EAL 1 (200 Times High Alarm)[3]	EAL 2 Monitor Reading[2]	EAL 1 Monitor Reading[2]	EAL 1 Monitor Reading[2]
RM-043	LRWPB Stack (Gas)		6.60E+05 cpm		1.0E+07 cpm[5]		
RM-052	AB Stack (Gas)	7.82E+04 cpm	7.04E+05 cpm	7.82E+06 cpm	Use RM-063		
RM-062	AB Stack (Gas)	6.60E+04 cpm	6.37E+05 cpm	6.60E+06 cpm	Use RM-063		
RM-063[4]	AB Stack (Post Accident Gas)		2.29E-03 μCi/cc		2.29E-01 μCi/cc	3.71E-01 μCi/cc	3.71 E+00 μCi/cc
RM-057	Condenser Off-Gas		1.45E+08 cpm[8]		See Note 7	See Note 7	See Note 7
RM-064[6]	Post Accident Main Steam (Gas)				75.7 cpm	1.05E+02 cpm	8.81E+02 cpm
RM-054A	S/G Blowdown	9.86E+04 cpm	9.86E+04 cpm	9.86E+06 cpm	9.86E+06 cpm		
RM-054B	S/G Blowdown	9.88E+04 cpm	9.88E+04 cpm	9.88E+06 cpm	9.88E+06 cpm		
RM-055 (Minimum 1 CW Pump)	Overboard Disch Hdr	2.80E+06 cpm	2.80E+06 cpm	1.0E+07 cpm[5]	1.0E+07 cpm[5]		
RM-055 (Minimum 2 RW Pumps)	Overboard Disch Hdr	8.00E+05 cpm	8.00E+05 cpm	1.0E+07 cpm[5]	1.0E+07 cpm[5]		

NOTE 1: Based on two times the High Alarm setpoint determined per the ODCM
NOTE 2: Based on RA 03-004
NOTE 3: Based on two hundred times the High Alarm setpoint determined per the ODCM
NOTE 4: RM-063 is an accident range monitor and receives sample flow via MV1 from RM-062 when RM-062 reaches 5.0E+06 cpm or RM-063 exceeds 5.0 E-3 μCi/cc. Sample flow is diverted back to RM-062 when RM-063 lowers to 5.0 E-3 μCi/cc.
NOTE 5: 1.0E+07 cpm is the upper range of the instrument.
NOTE 6: RM-064 is an off-line post accident range monitor designed to monitor the Main Steam System during a steam generator tube rupture event and is not used for IC AU1.
NOTE 7: Line condenser Off-gas up to the Auxiliary Building Stack and use RM-063.
NOTE 8: 1.45E+08 cpm is the upper range of this instrument.

Facility: Fort Calhoun Station Scenario No.: __1____ Revision __0__ Op-Test No.: _______

Examiners: ______________________ Operators: ______________________

Initial Conditions: 100% power, FW-54 Out of service due to excessive vibration.

Turnover: Continue full power operation. Rotate CA-1A on and place CA-1C in CR Start.

Event No.	Malf. No.	Event Type*	Event Description
1		N-BOPO	Rotate Air Compressors.
2		I-ATCO TS-CRS	Power Range NI Channel 'B' Fails
3		C-BOPO	Condensate pump 'FW-2B' trips
4		C-ATCO	Charging pump 'CH-1C' degraded flow
5		C-BOPO	Pressure Control valve, 'PCV-910', fails open
6		C-All TS-CRS	Instrument Inverter 'D' fails
7		N-All R-ATCO	AOP-05 or OP-4 Power Reduction
8		M-All	DC Bus #2 fails
9		I-ATCO	PPLS fails to actuate
10		C-BOPO	S/G Safety Valve Fails Open

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5–8)	8
2. Malfunctions after EOP entry (1–2)	2
3. Abnormal events (2–4)	3
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	2
6. EOP contingencies requiring substantive actions (0–2)	1
7. Critical tasks (2–3)	2

SCENARIO SUMMARY NRC #1

The crew will assume the watch at 100% power, with FW-54 out of service for excessive vibrations and instructions to continue full power operations.

The first event is rotating Air Compressors, AC-1A will be placed in service and AC-1C will be made the CR Start Air Compressor.

The next event is a failure of Power Range NI Channel 'B' high voltage power supply. Operator actions are per ARP-CB-4/A20 and AOP-15 and will direct bypassing affect trip units on the inoperable channel. SRO will refer to Technical Specifications. **T.S. 2.15.1(1) applies.**

The next event is Condensate Pump, FW-2B, trips on overcurrent and the standby pump does not automatically start. Operator actions are per ARP-CB-10,11/A12 and will direct manual starting of the standby Condensate Pump.

The next event is Charging Pump, CH-1C, degraded flow due to discharge relief valve leaking by. Operator actions are per ARP-CB-1,2,3/A2 and will direct rotation of Charging Pumps per OI-CH-1.

The next event is Steam Dump and Bypass valve, PCV-910 fails open. Operator actions may be to attempt to take manual control and close the valve and dispatching operator to isolate air to valves. CRS may enter AOP-40, OVERCOOLING/EXCESSIVE STEAM DEMAND., and direct the BOPO to reduce turbine load to maintain Tcold on program.

The next event is a failure of Instrument Inverter 'D' which deenergizes Instrument Bus AI-40D. Operator actions are per ARP-CB-20/A15, AOP-16 and continue in AOP-15. SRO will refer to Technical Specifications. With two Power Range Safety Channels inoperable, reduce power to less than or equal to 70% per OP-4, this is per **T.S. 2.15 Table 2.2**. But **T.S. 2.15.2(5)** is more limiting, 6 hours to hot shutdown for two or more RPS Logic Matrices inoperable and **T.S. 2.7(2)h** which requires all reactor protective and engineered safeguards instrument channels supplied by the other three buses to be operable, is not met and requires entry into **T.S. 2.0.1** and 6 hours to be in hot shutdown.

The next event is a power reduction per AOP-05, EMERGENCY SHUTDOWN or OP-4, LOAD CHANGE AND NORMAL POWER OPERATION.

The next event is a loss of DC Bus #2, resulting in the MSIV's going closed and tripping the reactor. The crew will enter EOP-00 and perform standard post trip actions. Following diagnosis of event, SRO will transition to EOP-20, FUNCTIONAL RECOVERY PROCEDURE. A S/G safety valve will fail open on RC-2B on the trip. The crew will take action to steam the unaffected S/G, RC-2A, prior to RC-2B reaching 27% WR by opening MS-291 **(critical task)**.

Scenario Event Description
NRC Scenario #1

When Pressurizer pressure lowers to 1600 psia PPLS will fail to actuate. The crew will recognize the failure of PPLS to actuate and manually actuate PPLS using the test switches **(critical task)**.

The scenario may be terminated when the affected S/G is isolated and the unaffected S/G has steam and feed flow established.

Op-Test No.: _____ Scenario No.: 1 Event No.: 1

Event Description: Rotate CA-1A on and place CA-1C is CR Start.

Time	Position	Applicant's Actions or Behavior
	CRS	Direct BOPO to place CA-1A in service and place CA-1C in CR Start per OI-CA-1 Att 4.
	BOPO	Per OI-CA-1 Att 4. Directs Waterplant Operator to Room 19 for rotation. Read notes on page 23.
	BOPO	If only rotating Standby and CR Start Compressors. (Step 1) NOTE: Rotating CR Start and running compressors, step is N/A.
	BOPO	If starting CA-1A perform the following: Direct Waterplant Operator to perform step 2.a, b, c, d and e.1. NOTE: Step 2.d is N/A.
Report as Waterplant Operator after one minute, that step 2.a, b, c and e.1 are complete: • **Crankcase oil level greater than one-half** • **PI-1942A, CA-1A Intercooler Inlet Pressure is greater than 30 psig** • **CA-1A-V, Crankcase Vent valve has been cycled** • **CA-1A Load Transfer Switch, 1LTS, in OFF** • **CA-1A Control Selector Switch, 1SS, in OFF**		
	BOPO	Place CA-1A Control Switch in AFTERSTART. (Step 2.e.2) Direct Waterplant Operator to start CA-1A by placing the 1SS switch to CS
Report as Waterplant operator that the 1SS is in CS.		
	BOPO	Direct the Waterplant Operator to perform steps 2.f – k.
Report as Waterplant Operator after one minute that steps 2.f through k are complete, all local indications are normal, the Load Transfer Switch for CA-1A is in position 1 and CA-1C is in OFF and CA-1A is holding pressure.		
	BOPO	Steps 3 and 4 are for starting CA-1B and CA-1C, steps are N/A.
	BOPO	If the Off-Going Compressor is to be placed in CR Start, perform the following: (Step 5) Direct Waterplant Operator to perform steps 5.a and b.
Report as Waterplant Operator that the 2SS switch is in OFF and FI-1955C indicates no flow.		
	BOPO	Place CA-1C control switch in AFTERSTOP. (Step 5.c)
		Event description continued on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 1

Event Description: Rotate CA-1A on and place CA-1C is CR Start.

Time	Position	Applicant's Actions or Behavior
	BOPO	Direct Waterplant Operator to perform steps 5.d and e.
Report as Waterplant Operator that the 2SS switch is in CS and the load transfer switch is in position 1.		
	BOPO	Steps 6,7 and 8 are for the standby Air Compressor, steps are N/A.
	BOPO	Direct Waterplant Operator to perform steps 9 and 10.
Report as Waterplant Operator that all Load Transfer switches are in position 1 or 2 and CA-1A has 35 psig of oil pressure.		
	BOPO	OI-CA-2 will not be performed, step is N/A.
		Event is terminated once the Air Compressors are rotated. Lead examiner will cue next event.

Op-Test No.: _____ Scenario No.: 1 Event No.: 2		Page 6 of 29
Event Description: Failure of Power Range NI Channel ‘B’ high voltage power supply.		

Time	Position	Applicant’s Actions or Behavior
	ATCO	Respond to multiple alarms including CB-4/A20 Window B-7, NUCLEAR INSTRUMENTATION CHANNEL INOPERATIVE, Window B-6, ROD DROP NUCLEAR INSTRUMENTATION CHANNEL, and Window E-6, NUCLEAR ΔT POWER CHANNEL DEVIATION
	CRS	With multiple alarms, directs BOPO or ATCO to monitor primary.
	ATCO	Enter ARP-CB-4/A20 Window B-7.
	CRS	Determine that entry conditions for AOP-15, LOSS OF FLUX INDICATION OR FLOW STREAMING, are met and enters AOP-15, Section I, Loss of Power Range Safety Channels.
	ATCO	**Per ARP-CB-4/A20** Verify testing of nuclear instrumentation is in progress. (Step 1) NOTE: No testing in progress, step is N/A.
	ATCO	If testing is not in progress, check the non-op light is on for one of the Safety Channel Drawers or WRNI drawers. (Step 2) NOTE: Channel B on.
	ATCO	Check the following for the Safety Channel with the non-op light: (Step 3): • Test Select Switches on Linear Power Range Drawer in OFF • Test Enable Switch on Linear Power Range Drawer in OPERATE • Level Test and Rate Test Switches in OPR for WRNI Drawers • NI drawer power on lights are on for WRNI Drawers • Detector high voltage dropped by greater than 100 volts for Linear Power Range Drawers NOTE: High voltage will indicate zero.
	ATCO	Verify the NI-004 non-operate light for ‘D’ Channel at AI-212 is out. (Step 4) Dispatch the Waterplant Operator to verify.
When dispatched as Waterplant Operator to verify non-op light at AI-212, report after one minute that the non-op light is out.		
	ATCO	If a safety channel is failed, implement AOP-15, LOSS OF FLUX INDICATION. (Step 5) NOTE: CRS may already be in AOP-15.
	ATCO	If a wide range channel has failed and power between 10-4% and 15%, implement AOP-15. (Step 6) NOTE: WR did not fail, AOP-15 entered in previous step, step is N/A.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 2

Event Description: Failure of Power Range NI Channel ‘B’ high voltage power supply.

Time	Position	Applicant’s Actions or Behavior
	CRS	**Per AOP-15.** Read notes on page 4.
	CRS	If any trip units, 1,2,9,10,12, are bypassed then bypass the remaining trip units. (Step 1) NOTE: No trip units are bypassed, step is N/A.
	CRS	Notify Manager Shift Operations or Work Week Manager of Power Range Safety Channel failure per SO-O-28. (Step 2)
	CRS	If one power range safety channel is inoperable, then place RPS Trip Units 1,2,9,10 and 12 in bypass within one hour. Directs the ATCO to bypass trips units. (Step 3)
	ATCO	Place RPS Trip Units 1,2,9,10 and 12 in bypass within one hour.
	CRS	If one power range safety channel is inoperable and the channel will be tripped, place affected Trip Units in trip within one hour. (Step 4) NOTE: No trips units are to be tripped, step is N/A.
	ATCO	Bypass the inoperable Power Range Channel on DCS. (Step 5)
	ATCO	If a dropped rod bistable is tripped, then reset the dropped rod bistable by: Toggle the reset switch and verify the bistable light is out. (Step 6) NOTE: There are no dropped rod bistables active.
	CRS	Direct Work Week Manager to restore Power Range Safety Channel to service. (Step 7)
	CRS	Read Note: Bypass of RPS Trip Units which receive an input from an inoperable Power Range Safety Channel is allowed for a maximum of seven days if the failure is due to a malfunctioning detector per TS 2.15.
	CRS	If the failure of the Power Range Safety Channel is due to a malfunctioning detector and seven days has elapsed, initiate plant shutdown. (Step 8) NOTE: Failure is not from a malfunctioning detector, step is N/A.
	CRS	Enter **T.S. 2.15.1(1).** Place the inoperable channel in either bypass or tripped condition within one hour. Channel may be bypassed up to 48 hours.
		Event is terminated once T.S. call is made. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: 1 Event No.: 3

Event Description: Condensate Pump, FW-2B trips and standby pump fails to auto start.

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm CB-10,11/A12 window A-5L, CONDENSATE PUMP B OVERLOAD/TRIP.
	BOPO	Informs CRS of trip of FW-2B and failure of automatic start of the standby pump.
	CRS	May direct BOPO to start FW-2C using ARP guidance or to start FW-2C and backup with ARP or procedure.
	BOPO	Enter ARP-CB-10,11/A12 window A-5L.
	ATCO/BOPO	**Per ARP-CB-10/11.** Dispatch operator to check status of FW-2B. (Step 1) May dispatch the Waterplant Operator to the breaker and Turbine Bldg Operator to FW-2B.
When directed as Turbine Bldg and/or Waterplant Operator to investigate FW-2B trip. Report after one minute that the breaker has tripped on overcurrent (WP), and/or FW-2B is hot to the touch. (TB)		
	BOPO	Verify the standby Condensate Pump has started, FW-2C. (Step 2) NOTE: Standby pump does not automatically start.
	BOPO	Start the standby Condensate Pump, FW-2C. (Step 2.1) 2.1.1 Place the 43/FW, Feedwater Pumps Selector Switch, in Off and verify 43/FW TRANSFER SWITCH OFF-AUTO is in alarm. CB-10,11/A10 B-6L NOTE: Alarm does not come in due to failure of stby circuit. 2.1.2 Start FW-2C, Condensate Pump. 2.1.3 Place the 43/FW switch in AUTO and verify alarm reset CB-10,11 /A10 B-6L NOTE: Alarm was not in.
	BOPO	Check for proper Feedwater Pump suction flow and Condenser Hotwell level. (Step 2.2) NOTE: The increase in feedflow may cause RCS pressure to drop less than 2075 psia.
	CRS	If transient causes RCS pressure to lower to less than 2075 psia, enter **T.S. 2.10.4(5)(a)(ii)** for RCS pressure less than 2075 psia, 2 hours to restore pressure.
		Event description continues on next page.

Event Description: Condensate Pump, FW-2B trips and standby pump fails to auto start.

Time	Position	Applicant's Actions or Behavior
	BOPO	Ensure 43-SIAS/FW2, Post SIAS/CSAS Running Condensate Pump is selected to FW-2C. (Step 2.3)
	BOPO	Check the following for the cause of the FW-2B trip (Step 2.4): • 49-50-83/FW-2B, time overcurrent relay tripped at 1A2 • Motor stopped from local stop pushbutton • Motor stopped from the 69 permissive switch • Low voltage on 4160V Bus 1A2
	CRS	Notify Work Week Manager of pump trip and standby pump fail to start. (Step 2.5)
	BOPO	IF automatically started, place the standby pump in After-Start. (Step 2.6) NOTE: Pump did not auto start, step is N/A.
	BOPO	Evaluate impact of standby pump start on XC105 and Gardel. (Step 2.7)
	BOPO	Read Note: Prevent a pump in PULL-OUT from auto starting by first matching flags for the pumps not in PULL-OUT.
	BOPO	If it is desired to align another pump to Standby. (Step 3) NOTE: No other pump available as a standby pump, step is N/A.
		Event is terminated when standby Condensate Pump is operating. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: 1 Event No.: 4	Page 10 of 29
Event Description: Charging Pump, CH-1C develops degraded flow.	

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-1,2,3/A2 A-6L CHARGING FLOW LO.
	ATCO	Informs CRS of lower than normal flow (~25 gpm).
	CRS	Direct ATCO to carry out actions of ARP.
	ATCO	Enter ARP-CB-1,2,3/A2 A-6L.
	ATCO/BOPO	Dispatch an operator to investigate degraded flow.
When directed as Auxiliary Bldg Operator to investigate CH-1C degraded flow. Report after one minute that the discharge relief valve piping appears to have flow.		
	ATCO	**Per ARP-CB-1,2,3/A2.** Check Charging Header flow. (Step 1)
	ATCO	If Charging Flow is lost, isolate Letdown by closing TCV-202 and HCV-204. (Step 2) NOTE: Charging flow is not lost.
	ATCO	If Charging Flow is less than 30 gpm, check the following: (Step 3) NOTE: Flow is ~25 gpm. • Charging Pump operation • Valve alignment • Piping break • Charging Pump discharge or suction relief valve
	ATCO	If a system leak is identified, implement AOP-33 or AOP-22. (Step 4) NOTE: There is no system leakage.
	ATCO	Read Note: Based on plant conditions, XC-105 and GARDEL may be invalid.
	ATCO	If required, rotate Charging Pumps per OI-CH-1. (Step 5)
	CRS	Directs rotating CH-1A or CH-1B on the securing CH-1C.
	CRS	Ensure compliance with T.S. 2.2 and 2.15. (Step 6) NOTE: T.S. 2.2.4 should be referenced, two Charging Pumps are required to be operable and is met by CH-1A and CH-1B.
	ATCO	Ensure compliance with SO-O-23. (Step 7)
	ATCO	**Per OI-CH-1**. Read prerequisites for OI-CH-1 Attachment 5, 'Alternating Charging Pumps'.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 4

Event Description: Charging Pump CH-1C development degraded flow.

Time	Position	Applicant's Actions or Behavior
	ATCO	Start the selected Packing Cooling Pump a minimum of 30 minutes prior to starting Charging Pump. (Step 1) NOTE: Crew will determine not required, step is N/A.
	CRS	May direct not waiting 30 minutes.
	ATCO	If desired by SM to equalize the boron concentration in the oncoming pump, flush through drain valve. (Step 2) NOTE: Crew will determine not required, step is N/A.
	CRS	May direct flush not required.
	ATCO	Start the selected Charging Pump, CH-1A or CH-1B. (Step 3)
	ATCO	When charging flow has increased to 30 gpm on FIA-236, secure CH-1C. (Step 4)
	ATCO	Ensure any pressure oscillations in the Letdown line are dampened and stabilized by PCV-210. (Step 5)
	ATCO	Position the Charging Pumps Mode Select Stby switch to the desired backup Charging Pumps start sequence. (Step 6)
	ATCO	Stop CH-1C-1 Packing Cooling Pump 30 minutes after stopping Charging Pump CH-1C. (Step 7)
	ATCO	May place CH-1C in PULL-OUT to prevent automatic starting of a degraded pump.
		Event is terminated once Charging Pump is operating. Next event is cued at Lead Examiner's direction.

Event Description: Steam Dump and Bypass valve, PCV-910, fails open.

Time	Position	Applicant's Actions or Behavior
	ATCO/BOPO	Recognize RCS Tcold lowering from alarms and indications. NOTE: DCS will alarm for deviation between valve demand and valve position.
	BOPO	Direct Turbine Bldg Operator to isolate air to Steam Dump and Bypass valves.
	CRS	May direct BOPO to take manual control of PCV-910 and close valve. NOTE: Valve will not close.
When dispatched as Turbine Bldg Operator to isolate air to Steam Dump and Bypass, report after one minute that air is isolated and IA-594 is closed.		
	CRS	May enter AOP-40, OVERCOOLING/EXCESSIVE STEAM DEMAND.
	CRS	Verify no conditions that would require a plant trip. (Step 1) NOTE: No trip is required.
	BOPO	If Reactor Power is greater than 15%, adjust turbine load to maintain RCS Tcold on program per Attachment HR-12. (Step 2)
	BOPO	**Per Attachment HR-12.** Secondary Heat Removal per Attachment HR-12. If Turbine is online, ensure Turbine Control is in MANUAL. (Step 1)
	BOPO	Read Note: Output will be highlighted by a yellow box when selected.
	BOPO	Select OUTPUT by pushing the OUT button. (Step 2)
	BOPO	Read Note: Single arrow will adjust turbine load 0.1% and the double arrow 0.5% and maintain temperature within the program.
	BOPO	Adjust Turbine load by pressing the single or double UP or DOWN arrows to maintain the following: (Step 3) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
	BOPO	When PCV-910 closes, direct Turbine Bldg Operator to close the IA isolation to PCV-910 and reopen IA-594.
When dispatched to close the local isolation for PCV-910 and open IA-594, report after one minute that the local IA isolation for PCV-910 is closed and IA-594 is open.		
		Event is terminated air is isolated to PCV-910 and restored to the rest of the valves. Next event is cued at Lead Examiner's direction.

Event Description: Instrument Inverter ‘D’ failure.

Time	Position	Applicant’s Actions or Behavior
	BOPO	Respond to alarms CB-20/A15 D-6, INVERTER D TROUBLE, and CB-20/A15 D-8, INSTRUMENT BUS D LOW VOLTAGE/GROUND.
	BOPO	Inform CRS of alarms and loss of ‘D’ Instrument Bus.
	CRS	Directs ATCO to monitor the primary due to multiple alarms.
	BOPO	Enter ARP-CB-20/A15 D-6.
	CRS	Enters AOP-16, LOSS OF INSTRUMENT BUS POWER, Section I ‘Loss of Instrument Bus Power’. Transitions to Section V ‘Loss or Instrument Bus AI-40D’.
	BOPO	**Per ARP-CB-20/A15.** Read Note: Failure of one or both fans derates the ambient temperature limits of the inverter.
	BOPO	Dispatch operator to ‘D’ Inverter and check the following: (Step 1) • Inverter Supplying load light lit • In Sync light lit • Precharge light lit • Manual Switch 1 in Normal Position light lit • All other lights out • Both fans on top are operating • Manual Bypass Switch in Normal Operation
When directed as Waterplant Operator to investigate Inverter D. Report after one minute that the Inverter has good voltage but no current and is on the bypass transformer. **When asked about indications per step 1, all indicate as required.**		
	BOPO	Check Inverter ‘D’ Bypass Transformer breaker, MCC-4C1-F05. (Step 2)
	BOPO	Check indications on AI-40D. (Step 3) • If V/I BUS D is less than 108 VAC, implement AOP-16. NOTE: Bus is de-energized and reading zero volts • Instrument Bus D ground light lit. NOTE: Both lights will be off due the being de-energized
	BOPO	If I-BUS-D-GRND1 or I-BUS-D-GRND2 is brightly lit, locate source. (Step 4) NOTE: Both ground indicating lights are off, step is N/A.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 6

Event Description: Instrument Inverter 'D' failure.

Time	Position	Applicant's Actions or Behavior
	BOPO	If any of the following conditions exist determine reason: (Step 5) • EE-8L-S1 in bypass • MCC-4C1-F05 is open
	CRS	Notify the Work Week Manager of Inverter 'D' trouble. (Step 6)
	CRS	**Per AOP-16.** Read Notes on page 65.
	CRS	Verify a loss of Instrument Bus 'D' by one of the following: (Step 1) • Instrument Bus D voltage less than 108v • Inverter D Trouble alarm • Swing Inverter, EE-8T, trouble alarm • Instrument Bus D Low Voltage/Ground alarm
	CRS	Read Note: Instruments or equipment inoperable associated with RCS Heat Removal Safety Function
	BOPO	Verifies S/G levels are 35-85% NR (Step 2)
	CRS	Read Notes: Instruments or equipment inoperable associated with Reactivity Control Safety Function.
	ATCO	Verify clutch power supply is deenergized by the following: (Step 3) • AI-3-PS2 output current is 0 • AI-3-PS4 output current is 0 • AI-3-PS2 indicating lights are out • AI-3-PS4 indicating lights are out
	ATCO	Bypass all Channel 'D' Bistable Trip Units. (Step 4) NOTE: Channel 'B' has trip units bypassed, 'D' Channel fails to trip condition which will satisfy AOP-15 for two Power Range channels failed.
	CRS	Comply with T.S. 2.15.2(5). (Step 5) Enter **T.S. 2.15.2(5).** Be in Hot Shutdown and verify no more than one CEA is capable of being withdrawn within 6 hours. For two or more RPS Logic Matrices inoperable. NOTE: Three RPS Logic Matrices are inoperable.
	CRS	Read Notes: Instruments or equipment inoperable associated with Vital Auxiliaries Safety Function
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 6

Event Description: Instrument Inverter 'D' failure.

Time	Position	Applicant's Actions or Behavior
	ATCO	Ensures CCW system operation: (Step 6) • At least one CCW pump running • CCW pressure greater than or equal to 60 psig
	ATCO	Ensures at least one Raw Water Pump running. (Step 7)
	BOPO	Ensures Instrument Air Pressure greater than or equal to 90 psig. (Step 8)
	CRS	Read Note: Instruments or equipment inoperable associated with RCS Inventory Control Safety Function
	ATCO	Maintain pressurizer level at 30-70%, trending to 45-60% using CH-1A or CH-1B per Attachment IC-11, Inventory Control. (Step 9)
	CRS	Read Note: Instruments or equipment inoperable associated with RCS Pressure Control Safety Function
	ATCO	Maintain RCS pressure per Attachment PC-12, RCS Pressure-Temperature Limits and Attachment PC-11, Pressure Control. (Step 10)
	CRS	Read Notes: Associated with PORV's
	CRS	Consider closing both PORV block valves. (Step 11)
	ATCO	If directed, close HCV-150 and HCV-151.
	CRS	Read Note: Instruments or equipment inoperable associated with Core Heat Removal Safety Function.
	ATCO	Verify at least one RCP is running. (Step 12)
	CRS	Read Note: Instruments or equipment inoperable associated with Containment Integrity Safety Function
	ATCO	Confirm Containment Integrity: (Step13) • No unexpected rise in Containment Sump Level • No alarms on Containment Area Radiation Monitors • RM-051 not in alarm • RM-054A and RM-057 not in alarm • Containment Pressure less than 3 psig • Containment Temperature less than 120°F
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 6

Event Description: Instrument Inverter 'D' failure.

Time	Position	Applicant's Actions or Behavior
	CRS	Terminate all radioactive releases. (Step 14)
	CRS	If RM-052 is powered from AI-40D, direct transfer of RM-052 power to Instrument Bus C by placing AI-81-SW1 in 'C' position. (Step 15) NOTE: RM-052 is normally powered from AI-40C, step is N/A.
	BOPO	Isolate S/G Blowdown by closing the following valves: (Step 16) • HCV-1389 and HCV-1390 • HCV-1387A/B and HCV-1388A/B
	ATCO	Place the following radiation monitors in KEYPAD. (Step 17) • RM-054B • RM-055 • RM-062 • RM-063
	CRS	Read Note: Instruments or equipment inoperable associated with Engineered Safety Features System
	CRS	Refer to CH-ODCM-0001, Off-Site Dose Calculation Manual and Technical Specifications, 2.1.6 (if PORVs were isolated), 2.2, 2.7, 2.15, 2.21. NOTE: The limiting TS is 2.15.2(5) which was referenced at step 5.
	CRS	May return to **AOP-15**. Recognize two Power Range Safety Channels are inoperable and continue in AOP-15 step 10.
	CRS	Determine all Trip Units for 'D' Channel are already in the trip condition. (Step 10 and 11)
	ATCO	Bypass Power Range Channel D on DCS. (Step 12)
	CRS	With two Power Range Safety Channels inoperable, reduce power to less than or equal to 70% per OP-4, Load Change and Normal Power Operation. (Step 13) NOTE: **T.S. 2.15 Table 2.2** requires power reduction to 70% for two inoperable safety channels, but **T.S. 2.15.2(5)** is more limiting, 6 hours to hot shutdown and **T.S. 2.7(2)h** which requires all reactor protective and engineered safeguards instrument channels supplied by the other three buses to be operable, is not met and requires entry into **T.S. 2.0.1** and 6 hours to be in hot shutdown.
		Next event is terminated upon transition to shutdown.

Op-Test No.: _____ Scenario No.: 1 Event No.: 7

Event Description: Power Reduction per OP-4 or AOP-05.

Time	Position	Applicant's Actions or Behavior
	CRS	Enter AOP-05, EMERGENCY SHUTDOWN or OP-4, LOAD CHANGE AND NORMAL POWER OPERATION.
	CRS	**Per AOP-05.** Read notes on page 3, briefs the crew on the shutdown and gives Reactor trip criteria. NOTE: Trip criteria is in note 4.
	CRS	Read Note: TDB-III-23a and Power Ascension/Power Reduction Strategy provide guidance for shutdown.
	CRS	For additional guidance contact Reactor Engineer. (Step 1)
	CRS	Read Note: Operation of more than one Charging Pump will raise the rate of power reduction.
	ATCO	If borating from the SIRWT, perform the following: (Step 2) • Ensure one Charging Pump is operating • Open LCV-218-3 • Close LCV-218-2
	CRS	If borating from CVCS. (Step 3) NOTE: Step is N/A.
	CRS	Notify Energy Marketing of the power reduction. (Step 4)
	CRS	Read Note: Maintain Tcold per TDB Figure III.1, Tave Program.
	BOPO	Maintain RCS Temperature Control using Attachment HR-12, Secondary Heat Removal Operation within the following: (Step 5) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
	ATCO	Maintain Pressurizer Level using Attachment IC-11, Inventory Control within the following: (Step 6) • PZR level 45-60% • PZR level within 4% of program
	ATCO	Maintain VCT level 55-85% by performing the following: (Step 7) • Place LCV-218-1 to RWTS • When diversion to waste is complete, place LCV-218-1 in AUTO
		When down power has commenced and reactor effects have been noted. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: 1 Event No.: 7		Page 18 of 29
Event Description: Power Reduction per OP-4 or AOP-05.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Maximize pressurizer heaters and spray per the following: (Step 8) • Energize Backup Heaters by placing the Control Switch to ON for all four banks of heaters • Adjust the controller, PC-103X, setpoint pushbutton to maintain pressure 2080-2145 psia NOTE: Controller setpoint will be adjusted in the lower direction
	CRS	**Per OP-4, Attachment 2.** Read notes on page 21, briefs the crew on the shutdown and gives.
	CRS	Within 24 hours of shutdown lower VCT overpressure. (step 1) NOTE: Step is N/A.
	ATCO	Maximize pressurizer heaters and spray per OI-RC-7. (Step 2) • Verify selected controller is in Automatic, PC-103X • Ensure Proportional Heaters are in AUTO • Ensure Spray Valve Control Switches are in AUTO • Energize Backup Heaters by placing the Control Switch to ON for all four banks of heaters • Adjust the controller, PC-103X, setpoint pushbutton to maintain pressure 2080-2145 psia NOTE: Controller setpoint will be adjusted in the lower direction
	CRS	If additional charging is desired. (Step 3) NOTE: Additional not desired.
	CRS	Read Caution.
	BOPO	If Feed Reg valves oscillate, operate in Single Element or Manual per OI-FW-3. (Step 4)
	CRS	Read Note.
	CRS	Lower Reactor Power while performing the following: (Step 5.a-f) • Lower Generator load to maintain Tave on program • If power lowers by more than 15% in one hour, inform chemist • Maintain Pressurizer level within 4% of program • Maintain Pressurizer pressure 2075-2150 psia • Maintain S/G level 55-75% • Maintain ASI per OI-RR-1
	ATCO	Add boric acid/demin water as necessary per OI-CH-4.
		When down power has commenced and reactor effects have been noted. Lead examiner will cue the next event.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

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 (Step 1)
	ATCO	Commences Emergency Boration when the uncontrolled cooldown is identified and performs contingency actions as follows: (Step 1.2) • Ensure both FCV-269X and FCV-269Y are closed • Open HCV-268, HCV-265 and HCV-258 • Start all Boric Acid and Charging Pumps • Close LCV-218-2 • Ensure LCV-218-3, HCV-257 and HCV-264 are closed • Borate until adequate shutdown margin is established
	BOPO	Verify turbine tripped as indicated by stop and intercept valves indicating closed. (Step 2)
	ATCO/BOPO	May direct operators to investigate for steam leaks.
When directed as Turbine Bldg operator to investigate for steam leaks, report after three minutes that there is steam in Room 81, but unable to see location.		
	BOPO	Ensure all of the following generator breakers tripped: output breakers 3451-4, 3451-5, and field breaker 41E/G1F. (Step 3) NOTE: 86/SVG relays do not trip, operator action will be required to open 4 & 5 breakers and may direct Turbine Bldg Operator to locally open the field ckt bkr.
If directed as Turbine Bldg Operator to open the field breaker, report after one minute that the breaker is open.		
	BOPO	Verify buses 1A3 and 1A4 energized. (Step 4)
	BOPO	Ensure Diesel Generators have started if SIAS has occurred. (Step 5)
	BOPO	Check that Buses 1A1 and 1A2 are energized. (Step 6)
	BOPO	Check that 125 VDC buses 1 and 2 are energized. (Step 7) NOTE: DC Bus 2 is deenergized.
		Event description continued on next page.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

Time	Position	Applicant's Actions or Behavior
	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. (Step 8)
	ATCO	Determine normal CCW system operation: At least one CCW pump operating, CCW 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. (Step 9).
	ATCO	Verify RCS Inventory Control by all of the following: PZR level 30-70%, trending to 45-60%, RCS subcooling greater than or equal to 20°F. Transition to contingency actions and manually control Charging and Letdown to restore Pzr level. (Step 10 and 10.1) NOTE: HCV-204 failed closed and isolated letdown on loss of DC bus and CH-1B has lost control power and can not be started if it was not running prior to trip.
	ATCO	When all the following stop and throttle criteria are satisfied: (Step 10.1.b) • RCS subcooling greater than or equal to 20°F • PZR level greater than or equal to 10% and not lowering • At least one S/G available for RCS heat removal • RVLMS indicates level above the top of the hot leg (43%) Throttle and stop any or all of the HPSI Pumps. NOTE: Stop and Throttle will be performed after the S/G has blown down. The ATCO will inform the CRS that the criteria is satisfied and be directed to perform by the CRS.
	ATCO	Verify RCS Pressure Control by all of the following: RCS pressure 1800-2300 psia, trending to 2050-2150 psia, and PORV's are closed. Transition to contingency actions to manually control PZR heater and spray to restore RCS pressure. (Step 11 and 11.4)
	ATCO	If RCS pressure is less than or equal to 1350 psia, trip a RCP in each loop. (Step 11.2) NOTE: RC-3B and RC-3D have lost control power which will require securing RC-3A and RC-3C.
	ATCO **(CT)**	**When RCS pressure reaches 1600 psia, operator will manually initiate PPLS when PPLS fails to actuate prior to exiting EOP-00.** **NOTE: Channel 'B' PPLS will not actuate due to loss of DC Bus 2.**
		Event description continues on next page.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

Time	Position	Applicant's Actions or Behavior
	ATCO	If RCS pressure is less than or equal to 1600 psia, verify safeguards are actuated by the following: (Step 11.3) • All PPLS relays have tripped • All VIAS relays have tripped • All SIAS relays have tripped • All CIAS relays have tripped • Ensure required pumps are running, SI-2A/B, SI-1A/B, CH-1A/B/C • Ensure SI flow is adequate per Attachment IC-13 NOTE: Only relays with power that actuate are 86A and 86A1. Due to loss of DC bus 2, SI-1B and SI-2B do not start due to no control power, CH-1B will not start if it was not running prior to trip due to no control power.
	ATCO	Verify Core Heat Removal by all of the following: RCP NPSH satisfied per Attachment PC-12, at least one RCP running and core ΔT less than or equal to 10°F. (Step 12)
	BOPO	Verify Main Feedwater is restoring level in at least one steam generator. (Step 13) Transition to contingency step 13.1, SGLS has actuated, feed will not be established.
	BOPO	Ensure both Feed Reg valves are closed and Bypass Valves ramped to 40-45%. (Step 13a,b) NOTE: SGIS will have closed the Bypass valves.
	BOPO	Place the 43/FW switch in OFF. (Step 13c)
	BOPO	Ensure no more than one Feed Pump is operating. (Step 13d) NOTE: FW-4A will be secured, FW-4B is running but has no control power.
	BOPO	Ensure no more than one Condensate Pump is operating, (Step 13e) NOTE: FW-2A will be secured, FW-2C is running but has no control power.
	BOPO	Stop all Heater Drain Pumps. (Step 13f) NOTE: FW-5A will be secured, FW-5B is running but has no control power.
	BOPO	Ensure S/G Blowdown Isolation valves are closed, HCV-1387A/B and HCV-1388A/B. (Step 13g)
	BOPO	Verify Steam Dump and Bypass Valves controlling RCS T_C 525-535°F and S/G pressure 850-925 psia. (Step 14) Transition to contingency action 14.2 for Tcold less than 525°F.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 8,9,10			Page 22 of 29
Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.			

Time	Position	Applicant's Actions or Behavior
	BOPO **(CT)**	**Steam the unaffected S/G, RC-2A, prior to 27% WR in the most affected S/G, RC-2B, by placing the control switch for MS-291 in OPEN and be in progress prior to dryout in RC-2B at 5%.**
	BOPO	Stop the cooldown by performing the following: • Close Steam Dump and Bypass valves and HCV-1040. (Step 14.2a,b) NOTE: MSIV's closed on loss of DC bus, the position of the valves has no affect on the RCS • Check both Air Assisted MS Safety Valves closed. (Step 14c) NOTE: MS-292 is closed and has no control power, MS-291 will be open for contingency action 14.2g to steam the least affected S/G prior to an uncontrolled Tcold rise of 5°F or 27% WR in the most affected S/G. • Isolate Steam Header by closing MSIV's when S/G pressure is less than 700 psia. (Step 14.2d) NOTE: MSIV's closed on loss of DC bus. • Ensure the following valves are closed when S/G pressure is less than or equal to 500 psia: HCV-1041A/C, HCV-1042A/C, HCV-1105/1106, HCV-1385/1386, HCV-1103/1104 (Step 14e) • When Tcold is less than 500°F, secure one RCP. (Step 14.3) NOTE: Two RCP's were secured when RCS pressure lowered to 1350 psia.
	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. (Step 15) NOTE: There is no power to the containment area radiation monitors, RM-062 and RM-054B.
	CRS	Determine that EOP-20 should be implemented per EOP-00 Section 6.0 (Step 16)
	CRS	Enter EOP-20, Functional Recovery Procedure, Success Path MVA-DC.
	CRS	Ensures that the MVA-DC is the appropriate success path. (Step 1)
	CRS	If both DC Buses are energized, go to step 81. (Step 2) Transition to contingency actions 2.1. If DC Bus 2 is deenergized, go to step 42. (Step 2.1b)
		Event description continues on next page.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

Time	Position	Applicant's Actions or Behavior
	CRS	Read Caution: HCV-438B and D may close after control power is transferred on AI-41B.
	BOPO	Transfer DC control power on AI-41B to emergency using pushbutton AI-41B-PB/EMERG, 'AI-41B-MTS EMERG SOURCE MANUAL TRANSFER. (Step 42a)
	BOPO	Direct operator to transfer control power to emergency per EOP-20, MVA-DC step 42b,c,d, e for the following: • PB-2/1A2-1A4-MTS, 'MANUAL TRANSFER PUSHBUTTON 1A2-1A4-MTS EMERGENCY SOURCE • PB-2/1B3B-4B-MTS, 'MANUAL TRANSFER PUSHBUTTON 1B3B-4B MTS EMERG SOURCE • ATD-D2, 'DIESEL D2 125 VDC MANUAL TRANSFER SWITCH • AI-179 DC POWER TRANSFER SWITCH, if FW-10 has a start signal and not running
	CRS	When DC Control Power is transferred to DC Bus 1 go to appropriate success path for jeopardized safety functions. (Step 43)
	CRS	May direct tripping of the 'B' Channel of safeguards.
	CRS	Go to the start of EOP-20 and commence with step 1.
	CRS	Implement the Emergency Plan. (Step 2)
	CRS	Read Note: Floating Step BB, Minimizing DC Loads, operator action required within 15 minutes of loss of a battery charger
	ATCO/BOPO	Monitor the floating steps. (Step 3)
	ATCO	May perform Floating Step DD, LETDOWN RESTORATION CRITERIA, which directs restoring letdown per Attachment IC-12, RESTORATION OF LETDOWN.
	CRS	If all feedwater was lost perform actions of stopping RCP's and isolating blowdown. (Step 4) NOTE: All feedwater has not been lost, step is N/A.
	CRS	Verify RCP operating parameters. (Step 5) NOTE: Actions required at this step should have been completed in EOP-00.
	CRS	If CIAS is present, direct Shift Chemist to perform rapid activity analysis on both S/G's. (Step 6) Transition to contingency actions, CIAS is present.
		Event description continues on next page.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

Time	Position	Applicant's Actions or Behavior
	ATCO	Direct Shift Chemist to sample both S/G's with CIAS present per the following: (Step 6.1) • Ensure sample drains swapped to waste, HCV-2509 is open and HCV-2508 is closed. • Perform a rapid activity analysis of both S/G's • Sample both S/G's per CH-SMP-SE-0015
When directed as Shift Chemist to swap sample drains and perform rapid activity analysis, report after two minutes that sample drains have been swapped and rapid activity analysis shows no activity in either S/G.		
	CRS	Identify a success path for each safety function using the Resource Assessment Trees. (Step 7)
	CRS	Determine that Heat Removal is in jeopardy and go to success path HR-3. NOTE: HR-3 is in jeopardy due to S/G level not being restored.
	CRS	Read Cautions: States LOCA's in containment can raise instrument inaccuracies and do not allow DG loads to exceed rating limits.
	CRS	If RCS pressure is less than or equal to 1600 psia, verify Engineered Safeguards. Verify PPLS, VIAS, SIAS and CIAS relays have actuated. (Step 1) NOTE: All relays previously verified in EOP-00.
	CRS	If Containment pressure is greater than or equal to 5 psig, verify Engineered Safeguards. (Step 2) NOTE: Pressure is <5 psig, step is N/A.
	ATCO	If SIAS has actuated, optimize SI flow by performing the following: (Step 3) • HPSI Pumps SI-2A/B running • LPSI Pumps SI-1A/B running • Charging Pumps CH-1A/B running • Emergency Boration in progress per Attachment RC-11 • Ensure acceptable SI flow per Attachment IC-13 NOTE: ATCO may secure CH-1B due to Stop and Throttle is progress.
	CRS	If high RCS pressure is preventing adequate SI flow. (Step 4) NOTE: SI flow is adequate, step is N/A.
	BOPO	May direct operator to restore normal power to DCS per Attachment MVA-23. (Step 5)
	CRS	If a SGTR is not is progress, go to step 21. (Step 6)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 8,9,10		
Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.		

Time	Position	Applicant's Actions or Behavior
	CRS	If rising Containment pressure due to high energy line break. (Step 21) NOTE: There is no break in containment, step is N/A.
	CRS	If a UHE is not in progress, go to step 29. (Step 22) NOTE: There is a UHE due to the Main Steam safety failing open, continues to step 23.
	BOPO	Identify the most affected S/G by downward trends in any of the following: (Step 23) • Steam pressure • S/G level • RCS Tcold
	CRS	If either S/G pressure is less than or equal to 500 psia, ensure SGIS closes all valves. (Step 24) NOTE: Valves closed by SGIS were verified in EOP-00.
	CRS	If the UHE has been stopped due to SGIS, go to step 29. (Step 25) NOTE: UHE was not stopped by SGIS, continues to step 26.
	BOPO	Isolated the most affected S/G, RC-2B per Attachment HR-20. (Step 26b)
	BOPO	**Per Attachment HR-20.** Read Note: RCS Heat Removal takes precedence over isolation of a S/G with a tube rupture.
	BOPO	Isolate RC-2B by ensuring the following valves are closed: (Step 1a) • HCV-1042A, RC-2B MSIV • HCV-1042C, RC-2B MSIV Bypass valve • MS-292, Air Assisted MS Safety valve • FCV-1102, RC-2B Feed Reg valve • HCV-1106, RC-2B Feed Reg Bypass valve • HCV-1385, RC-2B Feed Header Isolation valve • HCV-1104, RC-2B Feed Reg Block valve • HCV-1387A, RC-2B Blowdown Isolation valve • HCV-1387B, RC-2B Blowdown Isolation valve • HCV-1108A, RC-2B AFW Isolation valve • HCV-1108B, RC-2B AFW Isolation valve
	BOPO	Direct operator to close MS-298, Steam Valves HCV-1041A & 1042A Packing Leakoff Line Isolation valve. (Step 1b)
When directed as Turbine Bldg operator to close MS-298, report after one minute that the valve has been closed.		
		Event description continues on next page.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate

Time	Position	Applicant's Actions or Behavior
	BOPO	If sampling is not in progress, close HCV-2507A/B. (Step 1c)
If contacted about sampling of S/G's, report as Shift Chemist that S/G sampling is not in progress.		
	BOPO	Close YCV-1045B by placing the 'ISOLATION VALVE YCV-1045B OVERRIDE SW' in Override and the 'S/G RC-2B STM TO FW-10 HDR B ISOLATION VALVE YCV-1045B' in close. (Step 1d)
	BOPO	Read Note: Air accumulators will maintain valve in a closed position for 30 minutes after loss of instrument air.
	BOPO	Direct the operator to handjack closed YCV-1045B
When directed as Turbine Bldg operator to handjack closed YCV-1045B, report after one minute that the valve has been handjack closed.		
	BOPO	Record time RC-2B was isolated. (Step 1e)
	BOPO	Verify RC-2B is the most affected S/G per Attachment HR-18. (Step 2)
	BOPO	Read Note: RCS Heat Removal takes precedence over isolation of a S/G with a tube rupture. (Att. HR-18)
	BOPO	Determine the most affected S/G by considering all of the following: (Step1) NOTE: HR-18 has one step. • S/G availability for heat removal • S/G contribution to offsite exposure • Severity of uncontrolled cooldown • Location of the leak • Containment conditions • Safety of personnel and safety related equipment
	BOPO	Verify RC-2B is isolated by downward trends on all of the following: (Step 27 of EOP-20 HR-3) • Steam pressure • S/G level • RCS Tcold
	CRS	Read Cautions: At top of page 331.
	CRS	If RC-2A is the least affected S/G, prepare to steam prior to 27% WR in RC-2B. (Step 28) NOTE: Steaming was commenced in EOP-00 using MS-291.
		Event description continues on next page.

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

Time	Position	Applicant's Actions or Behavior
	CRS	Steam least affected S/G by any or all of the following: (Step 29) • Attachment HR-12, Secondary Heat Removal • Attachment HR-21, Blowdown Operation NOTE: Steaming was commenced in EOP-00 using MS-291, Att. HR-12 step 11 is the direction for using MS-291.
	CRS	If both the feedring is available and SGIS has actuated, override SGIS on the least affected S/G per Attachment HR-14. (Step 30) NOTE: AFAS may actuate before feeding through the feedring can be established. Crew shall ensure that RC-2A is the only S/G being fed.
	BOPO	Place both SGIS Override Switches in OVERRIDE for the least affected S/G, RC-2A: (Step 1a Att. HR-14) • OR/HC-1386 • HC-1105
	BOPO	Open HCV-1386. (Step 1b)
	BOPO	Manually control HCV-1105, Feed Reg Bypass valve, to feed least affected S/G per Attachment HR-11, Manual Feed Control. (Step 2)
	BOPO	Verify S/G levels are controlled in automatic. (Step 1, Att. HR-11) NOTE: Manual control is directed by Att. HR-14, step is N/A.
	BOPO	If feeding RC-2A with FCV-1101 in manual. (Step 2) NOTE: SGIS is in override for the Bypass Valve, HCV-1105, step is N/A.
	BOPO	If feeding RC-2A with HCV-1105 in manual, perform the following: (Step 3) • Verify DCS screen displayed, Feedwater REG & BYP VALVES or Feedwater Control 2A. • Verify FCV-1101, Feed Reg valve is in manual and closed. • Push the MANUAL button for HCV-1105. Read Note: The out button will be highlighted by a yellow box when selected. • Verify OUT is selected for HCV-1105. Read Note: The single arrow will change output by 0.25%, the double arrow will change output by 5%. • Adjust output by pushing up or down single or double arrows.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 1 Event No.: 8,9,10

Event Description: DC Bus #2 is lost, S/G Safety valve,MS-279 fails open and PPLS fails to actuate.

Time	Position	Applicant's Actions or Behavior
	BOPO	Restores Feedwater flow to RC-2A via the feedring by overriding SGIS. OR AFAS has actuated and is feeding RC-2A via the Aux Feedwater nozzles and proper operation has been verified.
		Scenario is terminated after steam and feed is established to RC-2A.

Procedure Number	Procedure Title	Revision
OI-CA-1	COMPRESSED AIR NORMAL OPERATION	75
ARP-CB-4/A20		46
AOP-15	LOSS OF FLUX INDICATION OR FLOW STREAMING	14a
ARP-CB-10,11/A12		15
ARP-CB-1,2,3/A2		42a
OI-CH-1	CHEMICAL AND VOLUME CONTROL SYSTEM NORMAL OPERATION	92
AOP-40	OVERCOOLING/EXCESSIVE STEAM DEMAND	2
ARP-CB-20/A15		42
AOP-16	LOSS OF INSTRUMENT BUS POWER	20
AOP-05	EMERGENCY SHUTDOWN	12
EOP-00	STANDARD POST TRIP ACTIONS	31
	EOP/AOP ATTACHMENTS	0
	EOP/AOP FLOATING STEPS	5
EOP-20	FUNCTIONAL RECOVERY PROCEDURE	27a

Facility: Fort Calhoun Station Scenario No.: 2 Revision 0 Op-Test No.: _______

Examiners: ______________________ Operators: ______________________

______________________ ______________________

______________________ ______________________

Initial Conditions: 100% power. FW-54 Out of service due to excessive vibration.

Turnover: Continue full power operations. Rotate EHC-3A on and EHC-3B off.

Event No.	Malf. No.	Event Type*	Event Description
1		N-BOPO	Rotate EHC Pumps
2		I-ATCO TS-CRS	Pressurizer Pressure Safety Channel, 'A/PIA-102Y', fails low
3		C-BOPO TS-CRS	480v Bus, 1B3B-4B, Bus Tie Breaker trip
4		C-ATCO	'B' RCP Lower and Middle Seal failure
5		N-All R-ATCO	AOP-05 Power Reduction
6		C-BOPO	Stator Cooling Water Pump failure
7		M-All	Feedwater piping ruptures on discharge of FW-4B. Water spray will trip FW-4A. FW-4C will not start. Loss of all Feedwater.
8		C-BOPO	FW-6 pump coupling failure
9		C-BOPO	FW-10 trips on overspeed when started
10		C-ATCO	HPSI Pump, SI-2B, fails to start on safeguards actuation

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5–8)	7
2. Malfunctions after EOP entry (1–2)	3
3. Abnormal events (2–4)	2
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	2
6. EOP contingencies requiring substantive actions (0–2)	2
7. Critical tasks (2–3)	2

SCENARIO SUMMARY NRC #2

The crew will assume the watch at 100% power with FW-54 out of service due to excessive vibrations.

The first event is a rotation of Electrohydraulic Pumps, EHC-3A on and EHC-3B off.

The next event is a safety channel of pressurizer pressure, A/PT-102Y failing low. Operator actions are per ARP-CB-1,2,3/A4, Trip Unit #9 will be bypassed and **T.S. 2.15.1(1)** applies, and requires bypass within 1 hour and can remain bypassed for 48 hours.

The next event is a trip of 480v bus 1B3B-4B. Operator actions are per ARP-CB-20/A17 and include determining the cause and entry into AOP-32, LOSS OF 4160 VOLT OR 480V BUS POWER. SRO will refer to the Technical Specifications. Reference T.S. 2.7(2)l for Island bus 1B3B-4B inoperable, no time limit because 1B3A-4A and 1B3C-4C are operable. Enter **T.S. 2.4(1)b**, 7 day time limit for VA-7D being inoperable.

The next event is a failure of RC-3B Lower and Middle Seals. Operator actions are per ARP-CB-1,2,3/A6, ARP-CB-1,2,3/A1 and AOP-35, REACTOR COOLANT PUMP MALFUNCTIONS. Actions may include adjusting CCW flow to the seal cooler to clear high temperature alarm and adjusting RCP Bleedoff pressure. SRO will enter AOP-05, EMERGENCY SHUTDOWN, for two failed seals.

The next event is a plant shutdown per AOP-05.

Then next event is a failure on the running Stator Cooling Water pump. Operator actions are per ARP-CB-10,11/A10 and ARP-DCS-EHC. Operator will be dispatched and the standby Stator Cooling Water pump will be started and alarms will reset.

The next event will be a feedwater discharge piping rupture on FW-4B, the control room will attempt to start the standby feedwater pump, FW-4C, which fails to start. FW-4A will trip and the crew will recognize the need to trip the reactor due to inadequate feed flow. On the trip, FW-4B will trip.

When operators attempt to restore feedwater during post trip actions. FW-6 will start but the pump coupling will fail and the pump will have no flow. On start of FW-10, it will trip on overspeed. SRO will determine that all feedwater is lost and diagnostics will direct entering EOP-06, LOSS OF ALL FEEDWATER.

The crew will attempt to feed S/G's with condensate in EOP-06. During this time S/G level will lower to entry conditions for once through cooling. The crew will recognize once through cooling is required and perform actions for once through cooling prior to the least affected S/G level reaching 27% WR **(critical task)**. EOP-06 will send crew to EOP-20 HR-4 for once through cooling and verify actions taken. When initiating PPLS for once through cooling, SI-2B will fail to start. Crew will recognize the need for two HPSI pumps for adequate heat removal during once through cooling and start SI-2C **(critical task).**

The scenario can be terminated when once through cooling is established.

Op-Test No.: _____ Scenario No.: 2 Event No.: 1

Event Description: Rotate EHC-3A on and EHC-3B off.

Time	Position	Applicant's Actions or Behavior
	CRS	Direct BOPO to rotate EHC-3A on and EHC-3B off.
	BOPO	Enters OI-ST-12, Attachment 7, "NORMAL ROTATION OF ELECTROHYDRAULIC PUMPS."
	BOPO	Read Notes on page 15.
	BOPO	Start standby EHC Pump, EHC-3A. (Step 1)
	BOPO	Ensure EHC system pressure is stable and indicating greater than 1500 psig on PI-2101. (Step 2)
	BOPO	Check EHC-3A motor current is 40 to 50 amps. (Step 3)
	BOPO	Read Note
	BOPO	Check for proper local operation. (Step 4) • PI-5116 pressure approximately equal to PI-2101A pressure • PI-5115 pressure approximately equal to PI-2101A pressure • No bubbles visible in EHC-3A suction strainer NOTE: BOPO will direct the Turbine Bldg Operator to verify local operation per step 4.
When directed as Turbine Bldg Operator to verify local operation per step 4, report after 30 seconds that step 4 is completed and everything looks good.		
	BOPO	Stop EHC pump, EHC-3B by placing pump control switch in AFTERSTOP. (Step 5)
	BOPO	If EHC-3A fails to maintain adequate pressure, start EHC-3B. (Step 6) NOTE: Pressure is maintained, step is N/A.
		Event is terminated when EHC pumps are rotated. Lead examiner will cue next event.

Op-Test No.: _____ Scenario No.: 2 Event No.: 2		Page 4 of 20
Event Description: Pressurizer Pressure Safety Channel fails low.		

Time	**Position**	**Applicant's Actions or Behavior**
	ATCO	Respond to alarms CB-4/A20 Window A-5, TM/LOW PRESSURE CHANNEL TRIP, Window B-5, TM/LOW PRESSURE PRETRIP and CB-1,2,3/A4 Window A-5, PRESSURIZER SAFETY INJ SIGNAL LO-LO PRESSURE A/P102Y.
	ATCO	Inform CRS of failure of A/P102Y.
	BOPO	May verify common taps using P&ID.
	ATCO	Enters ARP-CB-4/A20 Window A-5.
	ATCO	Check for TM/LP trip lights. (Step 1) NOTE: Channel 'A' RPS will indicate tripped and no other channels.
	ATCO	Verify the following Reactor Protection and RCS parameters: (Step 2) • A,B,C,D/PIA-102Y, Pressurizer Pressure. NOTE: Only 'A' failed • TI-112C/122C, RCS Cold Leg Temps. NOTE: All are normal • ASI, NI and ΔT Power. NOTE: All are normal • TM/LP setpoint greater than 1750 psia. NOTE: All are normal • Verify Turbine load corresponds to Reactor Power. NOTE: No change in power
	ATCO	If any parameter is out of limit, trip the Reactor. (Step 3) NOTE: No parameters are out of limit.
	CRS	If all parameters are within limits, notify Work Week Manager. (Step 4)
	ATCO	If a TM/LP channel is declared inoperable, bypass the affected channel. (Step 5)
	CRS	Enter **T.S. 2.15.1(1) Table 2-2**, 1 hour to bypass trip unit and may be bypassed for 48 hours. Direct ATCO to bypass TL/LP Trip Unit on AI-31A.
	ATCO	Bypass Trip Unit #9 on AI-31A.
		Event is terminated once Tech Spec call is made and Trip Unit is bypassed. Lead examiner will cue next event.

Op-Test No.: _____ Scenario No.: 2 Event No.: 3	Page 5 of 20
Event Description: Loss of 480v Bus 1B3B-4B.	

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarms CB-20/A17 Window B-9, 480V BUS TIE BKRS TRIP/OFF NORM and Window D-8, 480V BUS 1B3A-4A 1B3B-4B 1B3C-4C LOW VOLTAGE. Will determine the 480v Bus which was lost and update the crew. May read placard on CB-20 which lists the major loads on the bus.
	BOPO	May walk down panels to verify proper equipment operation and determine that Condenser Evacuation pump, FW-8C, has tripped. FW-8A will be started on direction of CRS or per ARP-CB-10,11/A9 Window B-6U, VAC PUMP C STOPPED OR SEAL TEMP HI.
	CRS	Enter AOP-32, LOSS OF 4160 VOLT OR 480 VOLT BUS POWER, Section 1, Plant Stabilization and Diagnostics.
	BOPO	Enter ARP-CB-20/A17 Window B-9.
	BOPO	**Per ARP-CB-20/A17.** Determine the 480v Island Bus with the off normal breaker. (Step 1)
	BOPO	If the breaker has tripped, notify Work Week Manager. (Step 1.1)
	CRS	Notifies Work Week Manager of breaker trip.
	BOPO	Ensure minimum operable Safeguards Equipment is available. (Step 1.2) NOTE: Operator may have read the placard on CB-20 which lists major loads on the bus.
	BOPO	If the 480v supply breaker is not tripped and the normally closed bus tie breaker is open, perform the following: (Step 2 and 2.1) Dispatch Operator to check the following: • Check local 69 switch not in PULL TO LOCK • Check the 69 switch not in AFTER-TRIP • Check breaker is properly racked into position • Check Micrologic Trip unit alarm indication Check the Control Room switch not in PULL TO LOCK.
When directed as Waterplant Operator to investigate breaker trip, report after one minute that breaker BT-1B4B has tripped on overcurrent.		
	BOPO	If any 480v Bus is deenergized, implement AOP-32. (Step 3) NOTE: CRS may have entered the AOP earlier.
	BOPO	Refer to Technical Specification 2.7. (Step 4) NOTE: BOPO may inform CRS of TS reference.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 3		Page 6 of 20
Event Description: Loss of 480v Bus 1B3B-4B.		

Time	Position	Applicant's Actions or Behavior
	CRS	**Per AOP-32 Section I.** If a Reactor trip has occurred. (Step 1) NOTE: There was no reactor trip, step is N/A.
	ATCO	Ensure both DG Mode Selector Switches are in EMERGENCY STANDBY. (Step 2)
	CRS	If plant is not on SDC, go to step 9. (Step 3) NOTE: Plant is not on SDC, CRS shall go to step 9.
	BOPO	Verify at least one vital 4160v Bus is energized. (Step 9)
	ATCO	Verify CCW and RW operation. At least one CCW pump running with greater than 60 psig and at least one RW pump running. (Step 10 and 11)
	BOPO	Verify a Bearing Water pump is running and an Air Compressor with greater than 90 psig Instrument Air pressure. (Step 12 and 13)
	ATCO	Ensure a Charging Pump is operating and RCS pressure is maintained per Attachment 12. (Step 14 and 15)
	CRS	Terminate all radioactive releases. (Step 16)
	CRS	If the plant is on SDC, go to step 21. (Step 17) NOTE: Plant is not on SDC, step is N/A continues with step 18.
	ATCO	Verify at least one RCP is operating. (Step 18)
	BOPO	Maintains S/G levels at 35-85% per Attachment HR-11. (Step 19)
	BOPO	If condenser vacuum is greater than 19 inches, verify RCS temperature control by Normal Turbine Generator operation per Attachment HR-12. (Step 20)
	CRS	If lighting was lost. (Step 21) NOTE: Lighting was not lost, step is N/A.
	CRS	Determine lost bus and go to appropriate section of AOP. (Step 22) NOTE: CRS will go to section XX for Loss of 480v Bus 1B3B-4B.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 3	Page 7 of 20
Event Description: Loss of 480v Bus 1B3B-4B.	

Time	Position	Applicant's Actions or Behavior
	CRS	**Per AOP-32 Section XX.** Verify any or all of the following: (Step 1) • Low voltage alarm on CB-20/A17 Window D-8. • Breaker BT-1B3B tripped. • Breaker BT-1B4B tripped. NOTE: Low voltage alarm is in and BT-1B4B is tripped.
	CRS	If CH-1C was lost. (Step 2) NOTE: CH-1A is operating, step is N/A.
	CRS	Restore Condenser vacuum by starting FW-8A/B. (Step 3) NOTE: CRS may have directed starting of FW-8A when FW-8C tripped.
	CRS	Refer to Attachment B for list of components powered from 1B3B-4B. (Step 4)
	CRS	Determine the cause for loss of Bus 1B3B-4B. (Step 5) NOTE: CRS may have contacted the Work Week Manager of failure.
	CRS **(TS)**	Refer to Technical Specifications for operability requirements. (Step 6) Reference T.S. 2.2.4 for CH-1C inoperable, CH-1A/B are both operable and meet T.S. requirements. Reference T.S. 2.7(2)l for Island bus 1B3B-4B inoperable, no time limit because 1B3A-4A and 1B3C-4C are operable. Enter **T.S. 2.4(1)b**, 7 day time limit for VA-7D being inoperable
	CRS	Read Note.
	CRS	If no fault exists on bus 1B3B-4B. (Step 7) NOTE: Cause of breaker trip is still unknown, crew will not energize bus.
	CRS	If Bus 1B3B-4B is energized for Bus 1B3B. (Step 8) NOTE: Bus is not energized, step is N/A.
		Event terminated when AOP-32 Section XX is completed. Lead examiner will cue next event.

Event Description: RCP, RC-3B Lower and Middle Seals fail.

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarms CB-1,2,3/A6 Window B-1, REACTOR COOLANT PUMP RC-3B SEAL LEAKAGE FLOW HI.
	ATCO/BOPO	Determine that the lower and middle seals have failed on RC-3B by indications on the ERF and inform the CRS.
	CRS	Enter AOP-35, REACTOR COOLANT PUMP MALFUNCTIONS.
	ATCO	Enter ARP-CB-1,2,3/A6 Window B-1
	ATCO	**Per ARP-CB-1,2,3/A6.** Check RC-3B Seal parameters on ERF display 342 or 441. (Step 1)
	ATCO	If either of the following conditions is satisfied: (Step 2) • One or more seals indicate D/P less than 200 psid. NOTE: D/P is less than 200 psid. • Seal Bleedoff temperature greater than 180°F. Implement AOP-35 and inform the Director-Operations and Work Week Manager.
	CRS	Informs Director-Operations and Work Week Manager of entry into AOP.
	ATCO	If Seal Bleedoff flow is greater than 2.0 gpm, verify pressure is 40 to 60 psig. (Step 3) NOTE: Seal Bleedoff flow is less than 2.0 gpm and RCP Bleedoff pressure may be outside the normal band.
	ATCO	If pressure is outside 40 to 60 psig, perform the following: (Step 4) • Ensure HCV-241 and HCV-206 are open. NOTE: Both valves are open. • Adjust CH-275 to maintain Bleedoff Pressure in the normal band. NOTE: Pressure is outside normal band. • Monitor proper Seal Bleedoff flow for all RCP's. Note: May direct Aux Bldg Operator to adjust Seal Bleedoff Pressure.
If directed as Aux Bldg Operator to adjust Controlled Bleedoff pressure, report after one minute that you are standing by to adjust CH-275 or have opened the requested amount.		
	ATCO	Respond to alarm CB-1,2,3/A1 Window A-5L, CC WATER FROM RC-3B SEAL COOLER TEMP HI.
	ATCO	May enter ARP-CB-1,2,3/A1 Window A-5L.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 4	Page 9 of 20
Event Description: RCP, RC-3B Lower and Middle Seals fail.	

Time	Position	Applicant's Actions or Behavior
	ATCO	**Per ARP-CB-1,2,3/A1.** Read Caution: RCP operation is terminated after five minutes with no CCW flow.
	ATCO	Check the position of HCV-438A/B/C/D, RCP Cooler Containment Isolation valves. (Step 1) NOTE: Valves are open, steps 1.1 and 1.2 are N/A.
	ATCO	If high temperature is due to a loss of CCW, go to AOP-11. (Step 2) NOTE: CCW is not lost, step is N/A.
	ATCO	Read Note: Operating selector switch (HC-450/465) may cause momentary hi temp alarms.
	ATCO	Check TI-558/465, CCW temperature from RC-3B seal cooler, greater than 120°F. (Step 3) NOTE: Temperature is greater than 120°F.
	ATCO	Raise flow through RC-3B seal cooler by throttling open HCV-443, RC-3B PUMP SEAL CLR AC OUTL. (Step 4) • Monitor CCW flow on FI-450/453. • Monitor RC-3B parameters on the ERF. NOTE: ATCO will adjust controller to put more flow on seal cooler.
	CRS	**Per AOP-35, Section I.** Read notes on page 4.
	ATCO	Verify none of the following conditions exist: (Step 1) • Lower seal cavity temperature of 200°F • Vapor seal pressure equals RCS pressure • More than two seals failed NOTE: None of the conditions are met, does not trip reactor.
	ATCO	Verify proper seal operation by all of the following: (Step 2) • D/P across each pump seal is greater than 200 psid • Middle seal inlet pressure is greater than 500 psig with bleedoff flow greater than 0.5 gpm • Controlled Bleedoff temperature is less than 250°F NOTE: D/P is not met and transitions to contingency actions.
		Event description continued on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 4	Page 10 of 20
Event Description: RCP, RC-3B Lower and Middle Seals fail.	

Time	Position	Applicant's Actions or Behavior
	CRS	If only one seal is failed, continue to monitor seal parameters. (Step 2.1) NOTE: Two seals are failed.
	CRS	If any of the following conditions exists: (Step 2.2) • Two seals have failed • Middle seal inlet pressure is greater than 500 psig with bleedoff flow greater than 0.5 gpm • Controlled Bleedoff temperature is less than 250°F And the Reactor is critical, stop the affected RCP's by performing. NOTE: CRS will continue in this contingency action
	CRS	Commence immediate Plant Shutdown per AOP-05, EMERGENCY SHUTDOWN. (Step 2.2a)
	CRS	Continue to monitor seal parameters and for entry conditions of AOP-22. When Reactor is shutdown, stop the affected RCP. (Step 2.2b,c,d)
	ATCO	If Controlled Bleedoff temperature is greater than 165°F, ensure adequate CCW flow. (Step 3) NOTE: When temperature alarm comes in the ATCO will perform actions of ARP.
	CRS	Read Note: RCP Bleedoff pressure may not be obtained if the RCS is operating at low pressure.
	ATCO	Verify RCP Controlled Bleedoff pressure is 40 to 60 psig. (Step 4) NOTE: Pressure restoration also directed by ARP.
	ATCO	Ensure HCV-241 and HCV-206, CONTROLLED BLEEDOFF INBOARD AND OUTBOARD ISOLATIONS, are open. (Step 5) NOTE: Valve positions also verified by ARP.
	CRS	Verify normal seal operating parameters. (Step 6) NOTE: Seal does not meet normal parameters, transition to contingency actions and continue efforts to restore normal seal operation. (Step 6.1)
		Event is terminated when crew enters AOP-05 for shutdown.

Event Description: AOP-05, Emergency Shutdown.

Time	Position	Applicant's Actions or Behavior
	CRS	Enter AOP-05, EMERGENCY SHUTDOWN.
	CRS	**Per AOP-05.** Read notes on page 3, briefs the crew on the shutdown and gives Reactor trip criteria. NOTE: Trip criteria is in note 4.
	CRS	Read Note: TDB-III-23a and Power Ascension/Power Reduction Strategy provide guidance for shutdown.
	CRS	For additional guidance contact Reactor Engineer. (Step 1)
	CRS	Read Note: Operation of more than one Charging Pump will raise the rate of power reduction.
	ATCO	If borating from the SIRWT, perform the following: (Step 2) • Ensure one Charging Pump is operating • Open LCV-218-3 • Close LCV-218-2
	CRS	If borating from CVCS. (Step 3) NOTE: Step is N/A.
	CRS	Notify Energy Marketing of the power reduction. (Step 4)
	CRS	Read Note: Maintain Tcold per TDB Figure III.1, Tave Program.
	BOPO	Maintain RCS Temperature Control using Attachment HR-12, Secondary Heat Removal Operation within the following: (Step 5) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
	ATCO	Maintain Pressurizer Level using Attachment IC-11, Inventory Control within the following: (Step 6) • PZR level 45-60% • PZR level within 4% of program
	ATCO	Maintain VCT level 55-85% by performing the following: (Step 7) • Place LCV-218-1 to RWTS • When diversion to waste is complete, place LCV-218-1 in AUTO
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 6		Page 12 of 20
Event Description: AOP-05, Emergency Shutdown.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Maximize pressurizer heaters and spray per the following: (Step 8) • Energize Backup Heaters by placing the Control Switch to ON for all four banks of heaters • Adjust the controller, PC-103X, setpoint pushbutton to maintain pressure 2080-2145 psia NOTE: Controller setpoint will be adjusted in the lower direction
	CRS	Read Caution: Do not insert CEAs below PDIL.
	ATCO	Adjust Regulating Group 4 during shutdown to control ASI per OI-RR-1 Attachment 4. (Step 9)
	CRS	Notify Shift Chemist to sample RCS to satisfy T.S. 3.2, Equipment and Sampling Tests, for Reactor power changes greater than 15% in one hour. (Step 10)
	BOPO	**Per Attachment HR-12.** If Turbine is online, ensure Turbine Control is in MANUAL. (Step 1)
	BOPO	Read Note: Output will be highlighted by a yellow box when selected.
	BOPO	Select OUTPUT by pushing the OUT button. (Step 2)
	BOPO	Read Note: Single arrow will adjust turbine load 0.1% and the double arrow 0.5% and maintain temperature within the program.
	BOPO	Adjust Turbine load by pressing the single or double UP or DOWN arrows to maintain the following: (Step 3) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
		When down power has commenced and reactor effects have been noted. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: 2 Event No.: 6

Event Description: Stator Cooling Water Pump Trip.

Time	Position	Applicant's Actions or Behavior
	BOPO	Respond to alarm CB-10,11/A10 Window B-5U, STATOR COOLER PANEL TROUBLE. DCS alarms will show Low Flow and Low Pressure on Stator Cooling.
	BOPO	Enters ARP-CB-10,11/A10 and dispatches Turbine Bldg Operator to investigate Stator Cooling pumps. Informs CRS of alarms and failure of the standby Stator Cooling Water pump to start.
	CRS	May direct starting of the standby pump, ST-6A.
When directed as Turbine Bldg Operator to investigate Stator Cooling Water, report after 30 seconds that the pump is hot to the touch. If dispatched to the breaker, report after one minute that it has tripped.		
	BOPO	May direct Turbine Bldg Operator to ensure proper operation of Stator Cooling pump, ST-6A and ensure normal indications at AI-134.
When directed as Turbine Bldg Operator to ensure proper operation of Stator Cooling, report after one minute that ST-6A looks good and all indications and alarms at AI-134 are normal.		
	BOPO	May backup actions with ARP-DCS-EHC for the Stator Cooling Low Flow and Pressure alarms. NOTE: Dispatching operator and starting the standby pump was performed, all other actions will be N/A.
		Event is terminated when Stator Cooling Pump is started and plant is stable. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: 2 Event No.: 7,8,9

Event Description: Feedwater Rupture and FW-6 pump coupling fails, FW-10 trips on overspeed on start.

Time	Position	Applicant's Actions or Behavior
Report as Turbine Bldg Operator that there is a feed rupture on the discharge of Feedwater pump, FW-4B. If location is requested, report that it is between the pump and discharge valve.		
	BOPO	Recognize lowering S/G levels and verifies the following: • Feed Pump suction flow on CB-10/11 • Feed flow of DCS • Feed Regulating valves opening
	CRS	Directs starting of FW-4C and securing FW-4B.
	BOPO	Places 43/FW switch in OFF and verifies 43/FW TRANSFER SWITCH OFF-AUTO is in alarm.
	BOPO	Starts FW-30C, FW-4C Lube Oil pump.
	BOPO	Attempts to start FW-4C, pump does not start. Informs CRS of failure of FW-4C to start.
	BOPO	Report that FW-4A trips. May recommend tripping the reactor.
	CRS	Directs ATCO to trip the reactor and may direct BOPO to trip FW-4B.
	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 (Step 1)
	BOPO	Verify turbine tripped as indicated by stop and intercept valves indicating closed. (Step 2)
	BOPO	Ensure all of the following generator breakers tripped: output breakers 3451-4, 3451-5, and field breaker 41E/G1F. (Step 3)
	BOPO	Verify buses 1A3 and 1A4 energized. (Step 4)
	BOPO	Ensure Diesel Generators have started if SIAS has occurred. (Step 5) NOTE: No SIAS, DG's do not start.
	BOPO	Check that Buses 1A1 and 1A2 are energized. (Step 6)
	BOPO	Check that 125 VDC buses 1 and 2 are energized. (Step 7)
		Event description continued on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 7,8,9

Event Description: Feedwater Rupture and FW-6 pump coupling fails, FW-10 trips on overspeed on start.

Time	Position	Applicant's Actions or Behavior
	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. (Step 8)
	ATCO	Determine normal CCW system operation: At least one CCW pump operating, CCW 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. (Step 9).
	ATCO	Verify RCS Inventory Control by all of the following: PZR level 30-70%, trending to 45-60%, RCS subcooling greater than or equal to 20°F. Transition to contingency actions and manually control Charging and Letdown to restore Pzr level. (Step 10)
	ATCO	Verify RCS Pressure Control by all of the following: RCS pressure 1800-2300 psia, trending to 2050-2150 psia, and PORV's are closed. (Step 11)
	ATCO	Verify Core Heat Removal by all of the following: RCP NPSH satisfied per Attachment PC-12, at least one RCP running and core ΔT less than or equal to 10°F. (Step 12) NOTE: CRS may have directed tripping of RC-3B due to failed seals.
	BOPO	Requests from CRS to perform a contingency action 13.1c and start FW-6 to feed. Report to CRS on start of FW-6 that there is no flow but the pump is running.
	BOPO	Requests from CRS to perform a contingency action 13.1c and start FW-10 to feed. Report to CRS on start of FW-10 that the trouble alarm came in and the pump is not running.
	BOPO	May direct Waterplant Operator to investigate FW-6 and FW-10 failure to function correctly.
If directed as Waterplant Operator to investigate FW-6 & FW-10, report after one minute that FW-6 pump coupling has failed and FW-10 has tripped on overspeed.		
	BOPO	Verify Main Feedwater is restoring level in at least one steam generator. (Step 13) Transition to contingency step 13.1c, attempts to start AFW pumps failed.
	BOPO	Ensure both Feed Reg valves are closed and Bypass Valves ramped to 40-45%. (Step 13a,b)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 7,8,9

Event Description: Feedwater Rupture and FW-6 pump coupling fails, FW-10 trips on overspeed on start.

Time	Position	Applicant's Actions or Behavior
	BOPO	Place the 43/FW switch in OFF. (Step 13c)
	BOPO	Ensure no more than one Feed Pump is operating. (Step 13d) NOTE: No Feedwater Pumps are running.
	BOPO	Ensure no more than one Condensate Pump is operating, (Step 13e) NOTE: FW-2A will be secured, FW-2B is running.
	CRS	May direct securing all Condensate pumps to prevent feeding the leak.
	BOPO	Stop all Heater Drain Pumps. (Step 13f)
	BOPO	Ensure S/G Blowdown Isolation valves are closed, HCV-1387A/B and HCV-1388A/B. (Step 13g)
	BOPO	Verify Steam Dump and Bypass Valves controlling RCS T_C 525-535°F and S/G pressure 850-925 psia. (Step 14)
	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 (Step 15)
	CRS	Determine appropriate procedure to implement per Section 6, Diagnostic Actions (Step 16)
	CRS	Enters EOP-06, LOSS OF ALL FEEDWATER.
	CRS	Confirm SPTA's performed. (Step 1)
	CRS	Confirm diagnosis of Loss of All Feedwater by verifying Safety Function Status Check Acceptance Criteria. (Step 2)
	CRS	Implement the Emergency Plan. (Step 3)
	CRS	Read Note: Floating Step BB requires minimizing DC loads within 15 minutes of either battery charger.
	ATCO/BOPO	Monitor the Floating Steps. (Step 4)
	ATCO	Trip all RCP's. (Step 5)
	BOPO	May place TCV-909 controller in MANUAL and make output zero percent.
		Event description continued on next page

Op-Test No.: _____ Scenario No.: 2 Event No.:10		
Event Description: HPSI Pump, SI-2B fails to start on safeguards actuation.		

Time	Position	Applicant's Actions or Behavior
	BOPO	Minimize loss of S/G inventory by: (Step 6) • Ensure blowdown is isolated. NOTE: Blowdown was isolated in EOP-00. • Isolate blowdown sampling.
	BOPO	If Feedwater line break is suspected, isolate leak. (Step7) NOTE: May direct the Turbine Bldg operator to determine leak location.
If directed as Turbine Bldg operator to determine feed leak location, report after one minute that it is between the pump and discharge valve and still has some flow coming from break. Will require shutting the suction valve to completely isolate.		
	CRS	If SGIS has actuated. (Step 7) NOTE: SGIS has not actuated, step is N/A.
	CRS	If Off-Site power has been lost. (Step 9) NOTE: Off-Site power has not been lost, step is N/A.
	CRS	If Main Feedwater is available. (Step 10) NOTE: No Feedwater pumps are available, step is N/A.
	CRS	Initiate AFW using FW-6 or FW-10. (Step 11 & 12) NOTE: No AFW pumps are available, step is N/A.
	CRS	Make request status of FW-54 maintenance from the Work Week Manager and how long to return it to service.
If contacted as Work Week Manager on when FW-54 can be returned to service, report that it is partially disassembled and will require two hours to restore.		
	CRS	Read Caution on page 10.
	CRS	If any Condensate Pumps are operating and a flow path to at least one S/G is available perform the following. (Step 13)
	BOPO	Place all Feed Pump control switches is PULL TO LOCK. (Step 13a)
	BOPO	Locally open all Feed Pump Discharge valves. (Step 13b) NOTE: CRS and BOPO should discuss not using FW-4B due to rupture. BOPO will dispatch Turbine Bldg operator to open valves HCV-1150A and HCV-1150C.
When directed as Turbine Bldg operator to open HCV-1150A and HCV-1150C, report when valves are full open.		
		Event description continued on next page

Op-Test No.: _____ Scenario No.: 2 Event No.: 10		Page 18 of 20
Event Description: HPSI Pump, SI-2B fails to start on safeguards actuation.		

Time	Position	Applicant's Actions or Behavior
	BOPO	Verify all Feed Pump Recirc valves, FCV-1151A/B/C are closed.
	BOPO	Start all Feed Pump Lube Oil pumps, FW-30A/B/C. (Step 13d) NOTE: CRS and BOPO should discuss only starting FW-30A and FW-30C.
	BOPO	Reduce S/G pressure to less than 550 psia per Attachment HR-12. (Step 13e)
	BOPO	Per Attachment HR-12. If Turbine is online. (Step 1) NOTE: Turbine is not online, transitions to contingency action 1.1 which directs go to step 4.
	BOPO	Reads notes and caution on page 16.
	BOPO	If Steam Dump and Bypass is available, control RCS temperature with a single valve by performing the following: (Step 4) NOTE: BOPO will select PCV-910 as the valve to use. • Select the valve to be operated (PCV-910) • Place the controller for PCV-910 in MANUAL • Push the UP and DOWN arrows as required to adjust PCV-910 output NOTE: BOPO will lower S/G pressure till feed flow is established.
	ATCO	Per EOP-06 Maintain PZR level 10-70% per Attachment IC-11. (Step 13f)
	ATCO	Maintain RCS pressure per Attachment PC-12 by controlling PZR heaters and spray per Attachment PC-11. (Step 13g)
	BOPO	Locally ensure FCV-1172, Condensate Pump Recirc valve is closed. (Step 13h) NOTE: BOPO will direct Turbine Bldg Operator to ensure FCV-1172 is closed.
When directed as Turbine Bldg Operator to ensure FCV-1172 is closed, report after one minute that the valve is closed.		
	CRS	Read Note: SGLS Block Permissive is enabled at less than 550 psia.
	BOPO	When S/G pressure is less than 550 psia, ensure SGLS is blocked by performing: (Step 13i) • Place SGLS Block key into SGLS Block key switch • Block SGLS by turning key to BLOCK • Verify both SGLS 'A' and 'B' BLOCKED alarms
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 2 Event No.: 10

Event Description: HPSI Pump, SI-2B fails to start on safeguards actuation.

Time	Position	Applicant's Actions or Behavior
	BOPO	Ensure both Feed Header Isolation valves are open, HCV-1385/1386, and both Feed Reg Block valves are closed, HCV-1103/1104. (Step 13j, k)
	BOPO	Control feed flow with Feed Reg Bypass valves, HCV-1105/1106, per Attachment HR-11.
	ATCO/BOPO	Verify adequate RCS Heat Removal by both of the following: (Step14) • At least one S/G has level greater than or equal to 27% WR • TCS Tcold is stable or lowering.
	BOPO **(CT)**	**When the least affected S/G level is less than 27% WR, the crew will commence once through cooling and it will be in progress by 10% WR.**
	CRS	Transition to contingency action 14.1 and perform the following: NOTE: these steps line up plant for once through cooling and may be started prior to 27%.
	ATCO	If both Vital buses are energized perform the following: (Step 14.1 a.1) • Stop all RCP's. NOTE: This was performed in step 5 of EOP-06. • Deenergize all PZR heaters. • Initiate PPLS by placing both test switches in TEST. • Ensure two HPSI pumps start. • Ensure all HPSI Loop Injection valves are open. • Verify all Charging pumps start. • Ensure both PORV block valves are open, HCV-150/151. • Open PORV's. • Go to EOP-20, Success Path HR-4.
	ATCO **(CT)**	**On actuation of PPLS, recognize that SI-2B failed to start and start SI-2C before isolation of S/G's in EOP-20.**
	CRS	**Per EOP-20 HR-4.** Read Note and Cautions on page 381.
	CRS	Step 1 performs the actions just completed in EOP-06 step 14. Step 1.h is a go to step 60.
	BOPO	Isolate both S/G's. (Step 60)
		Terminate scenario when Once through Cooling is in progress.

Procedure Number	Procedure Title	Revision
OI-ST-12	TURBINE HYDRAULIC POWER UNIT OPERATION	31
ARP-CB-1,2,3/A4		32
OI-RC-7	REACTOR COOLANT SYSTEM PRESSURE CONTOL NORMAL OPERATION	18
ARP-CB-20/A17		30
AOP-32	LOSS OF 4160 VOLT OR 480 VOLT BUS POWER	19
OI-RM-1	RADIATION MONITORING	67
ARP-CB-1,2,3/A6		48
AOP-35	REACTOR COOLANT PUMP MALFUNCTIONS	7
ARP-CB-10,11/A10		17
ARP-DCS-EHC		5
AOP-05	EMERGENCY SHUTDOWN	12
EOP-00	STANDARD POST TRIP ACTIONS	31
	EOP/AOP ATTACHMENTS	0
	EOP/AOP FLOATING STEPS	5
EOP-06	LOSS OF ALL FEEDWATER	18
EOP-20	FUNCTIONAL RECOVERY PROCEDURE	27a

Facility: _Fort Calhoun Station__ Scenario No.: ___3____ Revision __1__ Op-Test No.: _______

Examiners: ____________________________ Operators: ____________________________

____________________________ ____________________________

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Initial Conditions: Reactor is currently at 100% power. DG-1 is out of service for Generator Brush replacement.

Turnover: Rotate AC-3C off for breaker maintenance and place AC-3A in service.

Event No.	Malf. No.	Event Type*	Event Description
1		N-ATCO	Rotate Component Cooling Water pumps.
2		C-ATCO TS-CRS	Dropped CEA.
3		N-ALL	AOP-05 shutdown to 70% power.
4		I-ATCO	Controlling Pressurizer Level Transmitter, LT-101X, fails high.
5		C-BOPO TS-CRS	Loss of 161 KV.
6		C-ATCO	Second Dropped CEA – Manual Reactor Trip Required.
7		M-ALL C-BOPO	Circulating Water Pump, CW-1C, breaker fails to open preventing DG-2 from loading onto bus 1A4 – Station Blackout

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5–8)	5
2. Malfunctions after EOP entry (1–2)	2
3. Abnormal events (2–4)	3
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	2
6. EOP contingencies requiring substantive actions (0–2)	2
7. Critical tasks (2–3)	3

SCENARIO SUMMARY NRC #3

The crew assumes the watch with the reactor at 100% power. Diesel Generator #1 is out of service for Generator brush replacement.

The first event is rotating Component Cooling Water pumps, place AC-3A in service and secure AC-3C. SRO will refer to Technical Specification. **T.S. 2.4(1)b, 7 day LCO** applies while CCW pump discharge valve is closed.

The next event is CEA 03 drops into core. This will require the BOPO to lower turbine load to restore RCS Tcold to program temperature. The CRS will direct the crew to lower Reactor power to less than 70% within one hour per **T.S. 2.10.2(4)e** and AOP-02, CEA AND CONTROL SYSTEM MALFUNCTIONS. The power reduction will be per AOP-05, EMERGENCY SHUTDOWN.

The next event is a plant shutdown to 70% per AOP-05.

The next event is a failure of the controlling pressurizer level instrument. Operator actions are taken per ARP-CB-1,2,3/A4 and OI-RC-8. The CRS may direct placing the pressurizer level control switch to channel Y and verify actions with OI.

The next event is a failure of the offsite 161 KV line to the plant. 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. The SRO will enter **T.S. 2.7.2(c)** for transformers T1A-3 and T1A-4 being inoperable and is a 72 hour time limit. The SRO will also enter **T.S. 2.0.1** for loss of 161 KV and DG-1 being out of service, two components inoperable in T.S. 2.7. Requires plant to be in Hot Shutdown within 6 hours.

The next event is a second dropped CEA placing the plant in an unanalyzed condition (2 dropped CEA's) requiring a manual reactor trip **(Critical Task).** The manual reactor trip will result in a loss of offsite power. This will require minimizing of DC Loads **(Critical Task).** DG-1 is OOS and the breaker for CW-1C, Circulating Water Pump, does not open preventing DG-2 from loading onto bus 1A4. The crew will recognize the failure of CW-1C breaker to open and direct local opening of the breaker which will allow DG-2 to power vital bus 1A4 **(Critical Task).**

The scenario may be terminated when Bus 1A4 is energized and all safety functions are verified.

Op-Test No.: _____ Scenario No.: 3 Event No.: 1			Page 3 of 19
Event Description: Rotate Component Cooling Water Pump, AC-3A on and secure AC-3C.			

Time	Position	Applicant's Actions or Behavior
	CRS	Direct ATCO to place AC-3A, CCW Pump, in service and secure AC-3C, CCW Pump, per OI-CC-1 Attachment 2.
	ATCO	Per OI-CC-1 Att 2. Read Note and Caution. Dispatch Aux Bldg Operator to standby for pump rotation.
	ATCO	Vent the pump to be started using AC-353, AC-3A Casing Vent valve. (Step 1) Directs Aux Bldg Operator to vent AC-3A per step 1.
When directed as Aux Bldg Operator to vent AC-3A, report after 30 seconds that AC-3A has been vented per step 1.		
	ATCO	Start AC-3A. (Step 2)
	CRS	Log into **T.S. 2.4(1)b**, 7 day time limit. (Step 3) NOTE: AC-3C will be inoperable while its discharge valve is closed.
	ATCO	Read Note: When stopping a CCW pump with two or more running, the discharge valve is closed to prevent check valve slamming.
	ATCO	Close AC-108, AC-3C Discharge valve. (Step 4) Directs Aux Bldg Operator to close AC-108.
When directed as Aux Bldg Operator to close AC-108, report after 15 seconds that AC-108 is closed.		
	ATCO	Verify PI-499, CCW Pump Disch Header Pressure, is approximately 90 psig. (Step 5)
	ATCO	Stop AC-3C. (Step 6)
	ATCO	Open AC-108. (Step 7) Direct Aux Bldg Operator to open AC-108 and independently verify open.
When directed as Aux Bldg Operator to open AC-108, report after 15 seconds that AC-108 is open and independently verified open.		
	CRS	Exit T.S. 2.4(1)b.
		Event is terminated when AC-3A is in service and AC-3C is secured and T.S. exited. Lead examiner will cue next event.

Op-Test No.: _____ Scenario No.: 3 Event No.: 2

Event Description: Rod 03 Drops into Core.

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to multiple alarms including CB-4/A20 Window B-6, ROD DROP NUCLEAR INSTRUMENTATION CHANNEL, CB-4/A8 Window B-1U & B1-L, ROD POSITION DEVIATION LOW AND LOW LOW LIMIT and Window A-5U and A-5L, ROD DRIVE POWER INTERRUPT and DROPPED ROD.
	ATCO	Determine that Rod 03 has dropped and is the only rod to drop. Informs the CRS.
	CRS	Directs the BOPO to maintain Tcold on program by reducing turbine load.
	CRS	Enters AOP-02, CEA AND CONTROL SYSTEM MALFUNCTIONS.
	CRS	May enter T.S 2.10.4(5)(ii) for RCS pressure lowering below 2075 psia during transient, 2 hours to restore.
	ATCO	Enter ARP-CB-4/A20 Window B-6.
	ATCO	**Per ARP-CB-4/A20.** If more than one rod dropped, then trip the reactor and go to EOP-00. (Step 1) NOTE: Only one rod dropped, so this step is N/A.
	ATCO	Check for indication of Dropped Rod (Step 2): • Core mimic for green rod bottom light NOTE: Rod 03 shows a green rod bottom light • Decrease in reactor power NOTE: Power is lowering • Decrease in reactor coolant loop Tavg NOTE: Tcold is lowering • DROPPED ROD (CB-4, A8, A-5L) NOTE: In alarm • 4" and 8" Rod Deviation Annunciators (CB-4, A8, B-1U and B1L) NOTE: Both in alarm • SCEAPIS indicates rod deviation NOTE: DEV indicated • SCEAPIS indicates dropped rod NOTE: ROD DROP indicated • PPDIL and PDIL alarms NOTE: In alarm • Rod drop light on RPS NOTE: On AI-31A/C
	ATCO	If a dropped rod is indicated, go to AOP-02. (Step 2.1) NOTE: CRS has entered AOP-02.
	ATCO	Reset the six rod drop detection circuit bistables on the four RPS Linear Power Channel and two Power Range Control Channel drawers. (Step 2.2)
	ATCO	If there is no indication of a dropped rod. (Step 3) NOTE: There is a dropped rod, step is N/A.
		Event description continues on next page.

Event Description: Rod 03 Drops into Core.

Time	Position	Applicant's Actions or Behavior
	ATCO	If NI channel high voltage is lost. (Step 4) NOTE: High voltage is not lost, step is N/A.
	ATCO	If switch is found out of position and testing is not in progress. (Step 5) NOTE: No testing in progress, step is N/A.
	ATCO	If an NI channel is declared inoperable. (Step 6) NI channel is not inoperable, step is N/A.
	CRS	**Per AOP-02, Section II, Misaligned Group A,B,N,1,2 or 3 CEA.** Review notes on page 21.
	CRS	If any of the following conditions exist: (Step 1) • Dropped CEA occurs during Reactor Startup • More than one CEA is misaligned by greater than 18 inches NOTE: No startup in progress and only one CEA dropped, step is N/A.
	CRS	Stop all CEA movement by placing Rod Mode Selector Switch in OFF. (Step 2)
	BOPO	Adjust Turbine load to match Reactor power per Attachment HR-12. (Step 3) NOTE: CRS directed this when the rod dropped.
	BOPO	**Per Attachment HR-12.** If Turbine is online, ensure Turbine Control is in MANUAL. (Step 1)
	BOPO	Read Note: Output will be highlighted by a yellow box when selected.
	BOPO	Select OUTPUT by pushing the OUT button. (Step 2)
	BOPO	Read Note: Single arrow will adjust turbine load 0.1% and the double arrow 0.5% and maintain temperature +0°F,- 1° of program per TDB-III.1.
	BOPO	Adjust Turbine load by pressing the single or double UP or DOWN arrows to maintain the following: (Step 3) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
	CRS	**Per AOP-02.** Establish steady Reactor power. (Step 4).
	ATCO	Ensure RCS pressure is 2075 psia to 2150 psia per Attachment PC-11. (Step 5)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 3 Event No.: 2		Page 6 of 19
Event Description: Rod 03 Drops into Core.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Ensure PZR level is within 2% of program level per Attachment IC-11. (Step 6)
	ATCO	Reset the rod drop detection circuit bistables on all RPS Linear Power Range and Power Range Control Channels. (Step 7)
	ATCO	Verify ROD DROP NUCLEAR INSTRUMENTATION CHANNEL alarm resets. (Step 8)
	CRS	Notify T&D Operations of power reduction and Reactor Engineer of CEA misalignment. (Step 9 and 10)
	CRS	If one or more Group N CEA's becomes misaligned. (Step 11) NOTE: No Group N rods are misaligned, step is N/A.
	CRS	Read Note: States that steps 12 and 13 are for misalignment of between 12 and 18 inches.
	CRS	If misaligned CEA is less than 18 inches. (Step 12) NOTE: CEA misaligned by greater than 18 inches, transitions to contingency action 12.1 which directs go to step 14.
	CRS	Read note and caution on page 16.
	CRS	Lower Reactor power to less than or equal to 70% ΔT Power within one hour using boration from the SIRWT per AOP-05, EMERGENCY SHUTDOWN. (Step 14)
	CRS	If Reactor power change is greater than 15% ΔT power in one hour, direct Shift Chemist to sample RCS to satisfy T.S. 3.2, Equipment and Sampling Tests. (Step 15)
	CRS	Enter **T.S. 2.10.2(4)e,** one hour to reduce power to ≤70% and within one hour after reducing power, restore CEA to within 12 inches of any CEA in its group.
		Event continues with transition to AOP-05.

Event Description: AOP-05, Emergency Shutdown.

Time	Position	Applicant's Actions or Behavior
	CRS	Enter AOP-05, EMERGENCY SHUTDOWN.
	CRS	Read notes on page 3, briefs the crew on the shutdown and gives Reactor trip criteria. NOTE: Trip criteria is in note 4.
	CRS	Read Note: TDB-III-23a and Power Ascension/Power Reduction Strategy provide guidance for shutdown.
	CRS	For additional guidance contact Reactor Engineer. (Step 1)
If contacted as Reactor Engineer for additional guidance, inform crew to use ReMAs guidance.		
	CRS	Read Note: Operation of more than one Charging Pump will raise the rate of power reduction.
	ATCO	If borating from the SIRWT, perform the following: (Step 2) • Ensure one Charging Pump is operating • Open LCV-218-3 • Close LCV-218-2
	CRS	If borating from CVCS. (Step 3) NOTE: Step is N/A.
	CRS	Notify Energy Marketing of the power reduction. (Step 4)
	CRS	Read Note: Maintain Tcold per TDB Figure III.1, Tave Program.
	BOPO	Maintain RCS Temperature Control using Attachment HR-12, Secondary Heat Removal Operation within the following: (Step 5) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
	ATCO	Maintain Pressurizer Level using Attachment IC-11, Inventory Control within the following: (Step 6) • PZR level 45-60% • PZR level within 4% of program
	ATCO	Maintain VCT level 55-85% by performing the following: (Step 7) • Place LCV-218-1 to RWTS • When diversion to waste is complete, place LCV-218-1 in AUTO
		Event description is continued next page.

Op-Test No.: _____ Scenario No.: 3 Event No.: 3		
Event Description: AOP-05, Emergency Shutdown.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Maximize pressurizer heaters and spray per the following: (Step 8) • Energize Backup Heaters by placing the Control Switch to ON for all four banks of heaters • Adjust the controller, PC-103X, setpoint pushbutton to maintain pressure 2080-2145 psia NOTE: Controller setpoint will be adjusted in the lower direction
	CRS	Read Caution: Do not insert CEAs below PDIL.
	ATCO	Adjust Regulating Group 4 during shutdown to control ASI per OI-RR-1 Attachment 4. (Step 9)
	CRS	Notify Shift Chemist to sample RCS to satisfy T.S. 3.2, Equipment and Sampling Tests, for Reactor power changes greater than 15% in one hour. (Step 10)
	BOPO	**Per Attachment HR-12.** If Turbine is online, ensure Turbine Control is in MANUAL. (Step 1)
	BOPO	Read Note: Output will be highlighted by a yellow box when selected.
	BOPO	Select OUTPUT by pushing the OUT button. (Step 2)
	BOPO	Read Note: Single arrow will adjust turbine load 0.1% and the double arrow 0.5% and maintain temperature within the program.
	BOPO	Adjust Turbine load by pressing the single or double UP or DOWN arrows to maintain the following: (Step 3) • Tcold 527-545°F • Tcold within +0°F, -1°F of program
		When down power has commenced and reactor effects have been noted, the lead examiner will cue the next malfunction.

Event Description: Controlling Pressurizer Level Transmitter fails hi.

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.
	ATCO	Diagnose the failure of the 'X' channel and inform CRS.
	CRS	May direct selecting the 'Y' channel and backup actions with ARP or to perform ARP actions.
	ATCO	Enter ARP-CB-1,2,3/A4 Window C-8.
	ATCO	Verify pressurizer level on LR-101X/LR-101Y. (Step 1)
	ATCO	If PZR Level is low, verify the following. (Step 2) NOTE: Transmitter is failing high, step is N/A.
	ATCO	If PZR Level is high, verify the following: (Step 3) NOTE: ATCO will determine level is high due to transmitter failure and not actual. • Verify VCT level trend. NOTE: Trend will be up as letdown flow increases. • Ensure one Charging pump is running • Ensure Letdown flow is maximized. NOTE: Letdown flow will be increasing to maximum. • Ensure Pressurizer Backup Heaters are energized.
	ATCO	If Automatic Pressurizer Level Control does not control, take manual control per OI-RC-8. (Step 4)
	CRS	May direct selecting the 'Y' channel and that manual control is not desired.
	ATCO	If LI-101X has failed, notify Work Week Manager. (Step 5)
	ATCO	If LI-101X has failed low, place HC-101-1, Pzr Heater Cutout Channel Selector Switch, to channel Y. (Step 5.1) NOTE: Transmitter failed high, step is N/A.
		Event is terminated once level is controlled either manually or using channel Y. Lead examiner will cue the next event.

Op-Test No.: _____ Scenario No.: 3 Event No.: 5		Page 10 of 19
Event Description: Loss of 161 KV.		

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	Report to CRS, 161 KV is lost and all 4160v buses are powered from 22 KV.
	CRS	Enter AOP-31, 161 KV GRID MALFUNCTIONS.
	BOPO	Enter ARP-CB-20/A15, Windows A-2.
	BOPO	**Per ARP-CB-20/A15.** If Reactor trips, go to EOP-00. (Step 1) NOTE: No trip, step is N/A.
	CRS	Verify fast transfer and implement AOP-31. (Step 2) NOTE: CRS may have entered AOP-31.
	CRS	If any 4160v Bus is not energized. (Step 3) NOTE: All 4160v Busses are energized, step is N/A.
	CRS	Notify System Operator and Shift Manager. (Step 4)
When notified as System Operator of loss of 161 KV, report that the 161 kV line has been lost and there is no time estimate for its return.		
	CRS	**Per AOP-31 Section II, All 4160 V Buses Fed from 22 KV.** Read Caution: To protect 1A1, FW-2A and FW-4A should not both be left running.
	CRS	If greater than 50% power, ensure 2 condensate pumps, 2 feed pumps, and 2 heater drain pumps are operating. (Step 1)
	BOPO	Adjust main generator terminal voltage less than 22,000 volts. (Step 2) NOTE: Voltage is less than 22 KV, step is N/A.
	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)
	CRS	Direct BOPO to rotate FW-5A on and FW-5B or FW-5C off per OI-VD-1.
	BOPO	**Per OI-VD-1 Attachment 2.** Perform prereq's of OI-VD-1, Att 2. Directs Turbine Bldg operator to go to the Heater Drain pumps for rotation.
		Event description continued on next page.

Event Description: Loss of 161 KV.

Time	Position	Applicant's Actions or Behavior
	BOPO	Direct Turbine Bldg operator to perform local actions of step 1.
When directed as Turbine Bldg operator to perform step 1, report after one minute that step 1 has been completed.		
	BOPO	Inform CRS to suspend GARDEL. (Step 2)
	CRS	May state for STA to suspend GARDEL.
	BOPO	Read cautions on page 15.
	BOPO	Place the 43/FW switch in OFF and verify the 43/FW TRANSFER SWITCH OFF AUTO is in alarm. (Step 3)
	BOPO	Read caution and note.
	BOPO	Start FW-5A by placing control switch in AFTER-START. (Step 4)
	BOPO	Verify ammeter returns to less than 80 amps in less than 15 seconds. (Step 5)
	BOPO	Ensure Recirculation valve, FCV-1216A, closes. (Step 6)
	BOPO	Read note and caution.
	BOPO	Stop the selected pump, FW-5B or FW-5C, by placing control switch in AFTER-STOP. (Step 7)
	BOPO	Read Note.
	BOPO	Direct Turbine Bldg operator to verify proper operation by performing local actions of steps 8 and 9.
	BOPO	Monitors following indications in the Control Room. (Step 8) • Motor amps • Heater Drain Tank level • Bearing temperatures on ERF display FWD
When directed as Turbine Bldg operator to perform local actions of step 8 and 9, report that all local indications look good and the pump is not rotating backwards.		
	BOPO	Place the 43/FW in AUTO and verify the alarm resets. (Step 10)
	BOPO	Inform CRS to restore GARDEL. (Step 11)
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 3 Event No.: 5		Page 12 of 19
Event Description: Loss of 161 KV.		

Time	Position	Applicant's Actions or Behavior
	BOPO	**Per AOP-31.** Verify voltage is greater than 430 volts on all the following buses: 1B3A, 1B3B, 1B3C, 1B4A, 1B4B, 1B4C. (Step 4) NOTE: All bus voltages are greater than 430 volts.
	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	Read caution.
	CRS	Place signs on switchgear room doors which direct personnel to stay out during 161 KV power outage. (Step 7)
	CRS	Prepare for loss of Off-Site power caused by a Reactor Trip by reviewing EOP-00, EOP-02, EOP-07 and EOP-20. (Step 8)
	CRS	Enter **T.S. 2.7.2(c)** for loss of 161 kV line making both house service transformers inoperable. May be inoperable for up to 72 hours, after which the reactor 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 **T.S. 2.0.1** because a loss of 161kV and DG-1 OOS concurrently, requires plant to be in Hot Shutdown within 6 hours.
		Event is terminated when plant is stabilized and TS entered. Lead examiner will cue next event.

Op-Test No.: _____ Scenario No.: 3 Event No.: 6,7		Page 13 of 19
Event Description: Second dropped rod (#1), CW-1C breaker failed closed.		

Time	Position	Applicant's Actions or Behavior
	ATCO	Respond to alarm CB-4/A20 Window B-6, ROD DROP NUCLEAR INSTRUMENTATION CHANNEL. Recognize a second dropped rod by alarms and indications.
	ATCO (CT)	**Manually trips the Reactor with two rods that have dropped into core within two minutes.**
	CRS	Direct tripping the Reactor.
	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 (Step 1)
	BOPO	Verify turbine tripped as indicated by stop and intercept valves indicating closed. (Step 2)
	BOPO	Ensure all of the following generator breakers tripped: output breakers 3451-4, 3451-5, and field breaker 41E/G1F. (Step 3)
	BOPO	Verify buses 1A3 and 1A4 energized. (Step 4) NOTE: Loss of off-site power, DG-1 OOS and DG-2 did not load onto 1A4, no bus is energized. Transition to contingency action 4.1a.
	BOPO (CT)	**Direct Waterplant Operator to minimize DC Loads per Attachment MVA-24 within 15 minutes.**
When directed as Waterplant Operator to minimize DC Loads per Attachment MVA-24, report after ten minutes that DC Loads have been minimized.		
	BOPO	Ensure Diesel Generators have started if SIAS has occurred. (Step 5) NOTE: DG-2 started due to loss of power.
	BOPO	Check that Buses 1A1 and 1A2 are energized. (Step 6) NOTE: No off-site power, no bus is energized.
	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) NOTE: No off-site power, no air compressor running and IA pressure will be lowering.
		Event description continues on next page.

Op-Test No.: _____ Scenario No.: 3 Event No.: 6,7		
Event Description: Second dropped rod (#1), CW-1C breaker failed closed.		

Time	Position	Applicant's Actions or Behavior
	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) NOTE: No off-site power, no CCW or RW pumps running.
	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) NOTE: No off-site power, level will be lowering with no charging pumps running.
	ATCO	Verify RCS pressure control: RCS pressure is 1800-2300 psia, trending to 2050-2150 psia and PORVs are closed. (Step 11) NOTE: No off-site power, pressure is lowering with no PZR heaters available.
	ATCO	Verify core heat removal via forced circulation, with no RCP's running transition to contingency action 12.2. (Step 12)
	ATCO	Place TCV-909 temperature controller in manual and ensure output is zero. (Step 12.2a,b)
	ATCO	Verify the development of natural circulation by all of the following: (Step 12.2c) • Core ΔT is less than or equal to 50°F • Difference between CET's and RCS Thot is less than or equal to 10°F • RCS subcooling is greater than or equal to 20°F • Thot and Tcold are stable or lowering NOTE: The ATCO may inform the CRS when natural circulation has been verified.
	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) NOTE: No off-site power, all pumps are off, transitions to contingency actions to restore Feedwater.
		Event description continues on next page.

Event Description: Second dropped rod (#1), CW-1C breaker failed closed.

Time	Position	Applicant's Actions or Behavior
	CRS	Directs initiating AFW with FW-54 when requested by the BOPO to perform contingency action for step 13.1b.
	BOPO	Starts FW-54 and commences restoration of S/G levels to 35-85% NR using the Feed Ring.
	BOPO	Verify steam dump and bypass valves are controlling RCS Tcold 525-535 degrees F and S/G pressure 850-925 psia. (Step 14) NOTE: No off-site power, no vacuum and SDBP will not be functioning, transitions to contingency actions for steaming.
	CRS	Directs steaming with HCV-1040 when requested by the BOPO to perform contingency action for step 14.1b.
	BOPO	Controls RCS temperature 525-535°F and S/G pressure 850-925 psia by controlling HCV-1040, Atmospheric Dump Valve.
	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 (RM-054A, RM-054B, and RM-057) are in alarm or trending upward. (Step 15a-e)
	ATCO	Verify containment pressure less than 3.0 psig and temperature less than 120 degrees F. (Step 15.f)
	CRS	Determine that EOP-07 should be implemented per EOP-00 section 6.0. (Step 16)
	CRS	Enter EOP-07, STATION BLACKOUT.
	CRS	Call T&D Operations to determine status of off-site power.
When contacted as T&D Operations on status of off-site power, report that 161 KV and 345 KV are unavailable, return is unknown at this time.		
	CRS	Confirm SPTA's have been performed. (Step 1)
	CRS	Confirm diagnosis of SBO by verifying SFSC acceptance criteria, (Step 2)
	CRS	Implement the Emergency Plan. (Step 3)
	CRS	Read Note: Floating Step BB, Minimizing DC Loads, requires action within 15 minutes.
	ATCO/BOPO	Monitor the Floating Steps. (Step 4)
		Event description continued on next page.

Event Description: Second dropped rod (#1), CW-1C breaker failed closed.

Time	Position	Applicant's Actions or Behavior
	CRS	If condenser vacuum is less than 19 inches, ensure SDBP valves and Turbine Stop valves are closed. (Step 5) NOTE: Valves are closed and verified closed in EOP-00.
	ATCO	Minimize RCS leakage by ensuring TCV-202, Letdown Isolation valve, is closed, RCP Controlled Bleedoff is aligned to the RCDT and RCS Sample Isolation valves, HCV-2504A/B, are closed. (Step 6)
	BOPO	Maintain S/G pressure 850-1000 psia by one of the following: (Step 7) • Attachment HR-12, Secondary Heat Removal Operation • Attachment HR-13, Local MS-291, MS-292 Operation • Attachment HR-17, FW-6/FW-10 Operation NOTE: Steaming was commenced in EOP-00 using HCV-1040 under contingency action 14.1b and will be controlled under Att. HR-12.
	BOPO	If feeding through the AFW Nozzles, operate FW-10 per Attachment HR-17. (Step 8) NOTE: Feeding is through the Feed Ring and commenced in EOP-00 using contingency action 13.1b. The feed valves may close on loss of air, BOPO may request to use HC-1105 & 1106 by placing in OPEN or start FW-10 and feed through the AFW nozzles.
		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, 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. However, the override of the feed reg bypass valves is NOT proceduralized in the EOP.
	BOPO	If feeding through the Feed Rings, verify S/G level 35-85% per both of the following: (Step 8.1) • Attachment HR-11, Manual Feed Control (DCS) • Attachment HR-16, FW-54 Operation
	CRS	Terminate all radiological releases. (Step 9)
	BOPO	Trip all the following 4160V breakers: 1A13, 1A33, 1A24, 1A44. (Step 10)
		Event description continues on next page.

Event Description: Second dropped rod (#1), CW-1C breaker failed closed.

Time	Position	Applicant's Actions or Behavior
	ATCO/BOPO	Ensure all the following breakers are tripped: (Step 11) • 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 NOTE: ATCO/BOPO will inform CRS that CW-1C breaker indicates closed and attempt to open breaker. When breaker does not open, direct Waterplant Operator to locally open breaker per Attachment MVA-12 per contingency action 11.1.
When directed as Waterplant Operator to open CW-IC breaker locally per Att MVA-12, report after one minute that the breaker will not open and request Electrical Maintenance support in opening breaker.		
	BOPO	Verify none of the following lockouts are tripped, 86/1A13, 86/1A33, 86/1A3-TFB. (Step 12) NOTE: No lockouts are tripped.
	CRS	CRS should not perform steps 13 and 14, DG-1 is OOS.
	BOPO	Verify none of the following lockouts are tripped, 86/1A24, 86/1A44, 86/1A4-TFB. (Step 15) NOTE: No lockouts are tripped.
	CRS	CRS should not perform steps 16 and 17, DG-2 is running and CW-1C breaker is holding out DG from loading onto bus 1A4.
Report as Waterplant Operator that EM was able to get the breaker for CW-1C open.		
	CRS	If either Vital 4160v bus is energized, go to step 26. (Step 18) NOTE: DG-2 will load onto bus 1A4.
	BOPO **(CT)**	**Ensure DG-2 has loaded onto 4160v Bus 1A4.**
	CRS	Direct STA to perform a Shutdown Margin Verification per RE-ST-RX-0008. (Step 26)
	CRS	Read note and caution.
		Event is terminated when DG-2 loads onto Bus 1A4 and loads have been started.

Op-Test No.: _____ Scenario No.: 3 Event No.: 6,7		Page 18 of 19
Event Description: Second dropped rod (#1), CW-1C breaker failed closed.		

Time	Position	Applicant's Actions or Behavior
	CRS	Maintain 20 to 100°F subcooling based on CET temperature by feeding and steaming one S/G. (Step 27) NOTE: From previous note, FW-10 is the preferred pump, crew may elect to continue with feed from FW-54 and steaming using HCV-1040.
	CRS	Will determine steps 28 to 35 are N/A. NOTE: These steps are for safeguards verification and no safeguards have actuated.
	ATCO/BOPO	Attempt to start all of the following equipment: (Step 36) • Two CCW pumps, AC-3A/B/C NOTE: Power to AC-3B only • One RW pump, AC-10A/B/C/D NOTE: Power to AC-10B/D only • One Bearing Water pump, AC-9 NOTE: Power to AC-9B only • One Air Compressor, CA-1A/B/C NOTE: Power to CA-1B only NOTE: DG loading should be monitored when starting equipment.
		Event is terminated when DG-2 loads onto Bus 1A4 and loads have been started.

Procedure Number	Procedure Title	Revision
OI-CC-1	COMPONENT COOLING SYSTEM NORMAL OPERATION	77
ARP-CB-4/A20		46
ARP-CB-4/A8		26
AOP-02	CEA and CONTROL SYSTEM MALFUNCTIONS	10a
AOP-05	EMERGENCY SHUTDOWN	12
ARP-CB-1,2,3/A4		32
OI-RC-8	REACTOR COOLANT SYSTEM LEVEL CONTROL NORMAL OPERATION	17
ARP-CB-20/A15		42
AOP-31	161 KV GRID MALFUNCTIONS	14
OI-VD-1	FEEDWATER HEATER VENTS AND DRAINS NORMAL OPERATION	55
EOP-00	STANDARD POST TRIP ACTIONS	31
	EOP/AOP ATTACHMENTS	0
	EOP/AOP FLOATING STEPS	5a
EOP-07	STATION BLACKOUT	17