Facility:	TMI – Unit 1	Task No.:	GOP002004
Task Title:	Calculate an Estimated Critical Boron Concentration	JPM No.:	TMI 2014 NRC ADM JPM RO A1-1
K/A Reference:	2.1.25 (3.9)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ____ Actual Performance: X

Classroom X Simulator ____ Plant ____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- A sequential trip of both main feedwater pumps resulted in a reactor trip yesterday at 1000.
- The reactor is expected to return to critical at time T=+35 hours after the reactor trip.
- Reactor Power was 80%
- The unit had been on-line for 208 days.
- The last down power was 21 days ago.
- Cycle Burnup is 470 EFPD.
- TAVE = 532˚F
- Current Boron Concentration = 1675 PPM
- The Desired Critical Rod Position is: 85% WD on CRG-6.
- The FINAL MIXED BORON DEPLETION CORRECTION FACTOR as specified in the control room log is .90
- No DTSQA-approved software is available for calculations.

Task Standard: Calculate an Estimated Critical Boron Concentration.

Required Materials:

- Calculator
- Ruler

General References: OP-TM-300-000, REACTIVITY AND POWER DISTRIBUTION CALCULATIONS, Rev. 5
OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION, Rev. 3

Handouts:	OP-TM-300-000, REACTIVITY AND POWER DISTRIBUTION CALCULATIONS, Rev. 5 OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION, Rev. 3
Initiating Cue:	You are the URO. A reactor startup is anticipated for this shift. Calculate Estimated Critical Boron IAW OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION.
Time Critical Task:	No
Validation Time:	30 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

OP-TM-300-402 Step 3.0

Performance Step: 1 Locates/reviews procedure Limits and Precautions.

Standard: The Examinee reviews LIMITS AND PRECAUTIONS.

Evaluator Cue: **Provide a clean copy of OP-TM-300-402 to the Examinee**

Comment:

OP-TM-300-402, Attachment 7.1

Performance Step: 2 Open Attachment 7.1 and use the following to complete.

Standard: The Examinee obtains Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 1

Performance Step: 3 Verify the average reactor coolant temperature, TAVE, from the Initial Conditions.

Standard: The Examinee verifies TAVE on Initial Conditions equals 532±2°F

Comment:

OP-TM-300-402 Attachment 7.1 Step 2

Performance Step: 4
- Record Cycle Burnup.

Standard: The Examinee records 470 EFPD from Initial Conditions on Line 2 of Attachment 7.1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 3

Performance Step: 5 Record Current Measure Boron Concentration

Standard: The Examinee records 1675 ppm from Initial Conditions on Line 3 of Attachment 7.1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 4

Performance Step: 6 Record the Desired Critical Rod Positions

Standard: The Examinee records the following information on Line 4 of Attachment 7.1:

CRG 1-4	100% WD
CRG 5	100% WD
CRG 6	85% WD
CRG 7	10% WD

Comment:

OP-TM-300-402 Attachment 7.1 Step 5

√ **Performance Step: 7** Determine and record Fuel Excess Reactivity IAW Figure 2 of OP-TM-300-000

Standard: The Examinee interprets Figure 2 and records 9.4% to 9.6% Δk/k on Line 5 of Attachment 7.1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 6

√ **Performance Step: 8** Determine and record the Desired Critical CRG 5-7 Reactivity Worth IAW Figure 5A of OP-TM-300-000

Standard: The Examinee interprets Figure 5A and records -1.0% to -1.2% dk/k on Line 6 of Attachment 7.1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 7

√ **Performance Step: 9** Determine and record the Xenon Reactivity Worth IAW Figure 13 of OP-TM-300-000.

Standard: The Examinee interprets Figure 13 and records -0.90% to -0.95% dk/k on Line 7 of Attachment 1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 8

√ **Performance Step: 10** Determine and record the Samarium and Plutonium Buildup IAW Figure 15 of OP-TM-300-000.

Standard: The Examinee interprets Figure 15 and records -0.07% to -0.08% dk/k on Line 8 of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 9

√ **Performance Step: 11** Calculate and record the Boron Reactivity Worth For Criticality Calculation.

Standard: The Examinee records the value 7.175% to 7.535% dk/k on Line 9 of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 10

√ **Performance Step: 12** Determine and record the Inverse Boron Worth IAW Figure 8 of OP-TM-300-000.

Standard: The Examinee interprets Figure 8 and records 133.5 to 134.5 ppmB / %dk/k on Line 10 of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 11a

√ **Performance Step: 13** Calculate and record the Critical Boron Concentration

Standard: The Examinee records 957.9 to 1013.5 ppmB on Line 11a of Attachment 7.1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 11b

√ **Performance Step: 14** Record the Final Mixed Boron Depletion Correction Factor.

Standard: The Examinee records 0.9 from Initial Conditions on Line 11b of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 11c

√ **Performance Step: 15** Calculate and record the Estimated Measured Critical Boron Concentration

Standard: The Examinee records 1064 to 1126 ppmB on Line 11c of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 12

Performance Step: 16 If this is a transient Xenon startup, then RECORD the interval that ECB is valid. Use the Xe value from Line 7 and a plot or table of Xe behavior with time. Estimate when Xe worth will be more or less negative than the value in Line 7 by 0.5% Δk/k.

Standard: The Examinee:

- o Determines that this is a transient Xenon startup.
- o Subtracts -0.5 Δk/k from -0.9 Δk/k. and comes up with -1.4 Δk/k.
- o Interprets Figure 13 and determines that -1.4 Δk/k. correlates with 28 hours after shutdown (27-29).
- o Determines that 28 hours after shutdown is 1400 today (1300-1500)
- o Subtracts +0.5 Δk/k from -0.9 Δk/k. and comes up with -0.4 Δk/k.
- o Interprets Figure 13 and determines that 0.4 Δk/k. correlates with 48 hours after shutdown (46-50).
- o Determines that 48 hours after shutdown is 1000 tomorrow (0800-1200)
- o Records the following on Line 12 of Attachment 7.1:
  - o "from" date as today.
  - o "from" time as calculated above.
  - o "to" date as tomorrow.
  - o "to" time as calculated above.

Comment:

OP-TM-300-402 Attachment 7.1

Performance Step: 17 Sign and add date/time

Standard: The Examinee signs and adds the date and time at the bottom of Attachment 7.1.

Comment:

Terminating Cue: **When the candidate returns the completed Attachment 7.1 to the examiner: This JPM is complete.**

STOP TIME: ______________

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

OP-TM-300-402
Revision 3
Page 3 of 4

ATTACHMENT 7.1
Estimated Critical Boron Concentration Calculation Data Sheet
Page 1 of 1

NOTE: Refer to Attachment 7.2 to complete this data sheet. Data may be entered in any sequence. Sign-off verifies all data entered as required. Approval signature indicates an "Independent Verification".

CALCULATION IS FOR AN ECB AT DATE/TIME __Current Date / Time__

1. T_{AVE} (Assume T_{AVE} = 532 ± 2°F) __532__ °F
2. CYCLE BURNUP __470__ EFPD
3. CURRENT MEASURED BORON CONCENTRATION __1675__ ppmB
4. DESIRED CRITICAL ROD POSITION
   - CRG 1-4 __100__ % WD
   - CRG 5 __100__ % WD
   - CRG 6 __85__ % WD
   - CRG 7 __10__ % WD
5. FUEL EXCESS REACTIVITY (FIG 2) __9.4 to 9.6__ % Δk/k
6. DESIRED CRITICAL CRG 5-7 REACTIVITY WORTH (FIG 5A) __-1.0 to -1.2__ % Δk/k
7. XENON REACTIVITY WORTH (PPC, REACTOR ENGR., FIG 13) __-0.85 to -0.95__ % Δk/k
8. SAMARIUM AND PLUTONIUM BUILDUP (FIG 15)
   - TIME SINCE SHUTDOWN __35__ HRS
   - REACTIVITY DUE TO BUILDUP __-0.07 to -0.08__ % Δk/k
9. BORON REACTIVITY WORTH FOR CRITICALITY CALCULATION
   (5 + 6 + 7 + 8) = __7.175 to 7.535__ % Δk/k
10. INVERSE BORON WORTH (FIG 6) __133.5 to 134.5__ ppmB/% Δk/k
11. CRITICAL BORON CONCENTRATION
    - 11a. CRITICAL BORON CONCENTRATION (9 x 10) = __957.9 to 1013.5__ ppmB
    - 11b. FINAL MIXED BORON DEPLETION CORRECTION FACTOR (PPC, Control Room Log, Reactor Engineering) __0.9__
    - 11c. ESTIMATED MEASURED CRITICAL BORON CONCENTRATION __1064 to 1126__ ppmB
12. If this is a transient Xenon startup, then RECORD the interval that ECB is valid
    From: Date/Time __Today / 1300-1500__ To: Date/Time __Tomorrow / 0800-1200__

CALCULATED BY: __Signature__ DATE/TIME __Current Date/ Time__

APPROVED BY (SRO): ________________________ DATE/TIME ____________

ANSWER KEY –
DO NOT PROVIDE TO EXAMINEE

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

VERIFICATION OF COMPLETION

Job Performance Measure No.: TMI 2014 NRC ADM JPM RO A1-1

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Initial Conditions:

- A sequential trip of both main feedwater pumps resulted in a reactor trip yesterday at 1000.
- The reactor is expected to return to critical at time T=+35 hours after the reactor trip.
- Reactor Power was 80%
- The unit had been on-line for 208 days.
- The last down power was 21 days ago.
- Cycle Burnup is 470 EFPD.
- TAVE = 532˚F
- Current Boron Concentration = 1675 PPM
- The Desired Critical Rod Position is: 85% WD on CRG-6.
- The FINAL MIXED BORON DEPLETION CORRECTION FACTOR as specified in the control room log is .90
- No DTSQA-approved software is available for calculations.

INITIATING CUE: You are the URO. A reactor startup is anticipated for this shift. Calculate Estimated Critical Boron IAW OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION.

TIME CRITICAL: No

Facility:	Three Mile Island	Task No.:	AOP602001
Task Title:	<u>Perform OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM.</u>	JPM No.:	TMI 2014 NRC ADM JPM RO A1-2
K/A Reference:	2.1.37 4.3 / 4.6	Facility Bank JPM 148 (Modified)	

Examinee: NRC Examiner:

Facility Evaluator: Date:

<u>Method of testing:</u>

Simulated Performance: ______ Actual Performance: __X__

Classroom __X__ Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The plant computer is not operational.
  - The computer has been off-line for 33 hours.
- Incore tilt was not exceeding the limits prior to the computer outage.
- No associated computer alarms were in prior to the computer outage.
- Recalibration of the NI's is not and has not been required.
- There are no dropped rods.
- All OCD's are operable.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements.
  - Calculator

Task Standard: Calculate quadrant power tilt.

Required Materials:

- COLR
- Calculator

General References:
- OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, Revision 2
- COLR
- Technical Specifications

An Attachment 7.1, OCD-ICD Tilt Correlation, KEY is attached to this JPM for evaluator use/information. <u>Ensure that the KEY is NOT provided to the applicants.</u>

Handout:
- OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM
- Examinees Data Sheet (attached behind the JPM CUE SHEET) containing the current NI power level and recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements.

Initiating Cue: Calculate quadrant power tilt IAW OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, based on the information provided.

Time Critical Task: No

Validation Time: 25 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR NOTE: **Ensure that the KEY is <u>NOT</u> provided to the applicants.**

OP-TM-300-202, Step 4.1

Performance Step: 1 IAAT the PPC, FIDMS, and FIS are all operable, then EXIT this procedure.

Standard: Determines from the given initial conditions that the PPC is not operable and continues.

Comment:

OP-TM-300-202, Step 4.2

Performance Step: 2 IF all OCDs are operable, THEN PERFORM the following:

(1) DETERMINE tilt IAW Step 4.5.

Standard: Examinee goes to Step 4.5

Comment:

PROCEDURE NOTE: **Tilt calculation must be performed once every 12 hours when the tilt alarm is inoperable.**

OP-TM-300-202, Step 4.5.1.1-4.5.1.2

Performance Step: 3 VERIFY computer alarms package for incore tilt was not in alarm immediately prior to loss of PPC, FIDMS, or FIS.

IF the alarms package was in the alarm state, THEN TAKE action as necessary to address the alarm before proceeding in this procedure.

Standard: Verifies the computer alarms package was not in an alarm state immediately prior to the loss of computer.

Comment:

OP-TM-300-202, Step 4.5.1.3

Performance Step: 4 RECORD last set of valid, steady state incore (FISo) and out-of-core (OCD_0) tilt measurements and the date and time the data was obtained on Attachment 7.1.

Standard: Examinee obtains the date and time that the data was obtained from the given data sheet and enters the data on Line A1 of Attachment 7.1.

Examinee obtains the FISo incore tilt measurements from the given data sheet and enters the following data on Line A2 of Attachment 7.1:

NI-5 (WX)	+1.23
NI-6 (YZ)	+2.28
NI-7 (XY)	+0.04
NI-8 (ZW)	-0.63

Examinee obtains the OCD out-of-core tilt measurements from the given data sheet and enters the following data on Line A3 of Attachment 7.1:

NI-5 (WX)	-0.88
NI-6 (YZ)	-0.06
NI-7 (XY)	+0.25
NI-8 (ZW)	-0.46

Comment:

OP-TM-300-202, Step 4.5.1.4

Performance Step: 5 CALCULATE total tilt per Section B of Attachment 7.1 at least once every 12 hours (T. S. 3.5.2.4.g)

Standard: Goes to Section B of Attachment 7.1.

Comment:

PROCEDURE NOTE: **This date must be less than 30 days from the reference date in A1.**

OP-TM-300-202, Attachment 7.1, Step B.1

Performance Step: 6 Date/Time of measurements.

Standard: Obtains the given Date and Time and enters the data on Line B.1 of Attachment 7.1.

Comment:

OP-TM-300-202, Attachment 7.1, Step B.2a

Performance Step: 7 Present NI power.

Standard: Obtains the given Present NI power and enters the data on Line B.2a of Attachment 7.1.

Comment:

OP-TM-300-202, Attachment 7.1, Step B.2b

√ **Performance Step: 8** Average NI power (Sum of B2a/4) - same number in all 4 blanks.

Standard: Examinee calculates Average NI power as follows:

(98.4 + 100.3 + 99.1 + 98.6) / 4 = 99.1

Examinee enters 99.1 four times on Line B.2b of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.3

√ **Performance Step: 9** Indicated NI tilt ([NI power/Average NI power]-1)*100

Standard: Examinee calculates NI tilt for each NI as follows:

NI5: [(98.4 / 99.1) – 1] * 100 = -0.706

NI6: [(100.3 / 99.1) – 1] * 100 = +1.210

NI7: [(99.1 / 99.1) – 1] * 100 = 0.000

NI8: [(98.6 / 99.1) – 1] * 100 = -0.504

Examinee enters the above solutions on Line B.3 of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.4

√ **Performance Step: 10** Change in indicated OCD tilt (B3-A3)

Standard: Examinee calculates the change in indicated OCD tilt as follows:

NI5: -0.706 - -0.88 = +0.174

NI6: +1.210 - -0.06 = +1.270

NI7: 0.000 – +0.25 = -0.250

NI8: -0.504 - -0.46 = -0.044

Examinee enters the above solutions on Line B.4 of Attachment 7.1.

Comment:

OP-TM-300-202, Attachment 7.1, Step B.5

Performance Step: 11 Recalibration correction [RECAL from Attachment 7.2 (=0 if no recalibration has occurred)]

Standard: Determines from intial conditions that no recalibration has occurred and enters zero on Line B.5 of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.6

√ **Performance Step: 12** Power correction (If B1-A1<24 hrs and no NI calibration has occurred, then power correction = 0, or =[0.731/(B2b/100)])

Standard: Examinee calculates power correction as follows:

[0.731 / (99.1 / 100)] = 0.738

Examinee enters 0.738 on Line B.6 of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.7

√ **Performance Step: 13** Total adjustments (B4+B5+B6)

Standard: Examinee calculates the total adjustments as follows:

NI5: +0.174 + 0.00 + 0.737 = 0.911

NI6: +1.270 + 0.00 + 0.737 = 2.008

NI7: -0.250 + 0.00 + 0.737 = 0.487

NI8: -0.044 + 0.00 + 0.737 = 0.692

Examinee enters the above solutions on Line B.7 of Attachment 7.1.

Comment:

Examiner's Note: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.8

√ **Performance Step: 14** OCD to ICD conversion factor [application (same factor applies for all quadrants) = 1.23*(B7) for no dropped rod, = 1.61*(B7) if a dropped rod exists in any quadrant]

Standard: Examinee:

- Determines from the initial conditions that no dropped rod exists.
- Calculates the OCD to ICD conversion factor as follows:
  - NI5: 1.23 * 0.911 = 1.120
  - NI6: 1.23 * 2.007 = 2.469
  - NI7: 1.23 * 0.487 = 0.599
  - NI8: 1.23 * 0.693 = 0.851
- Enters the above solutions on Line B.8 of Attachment 7.1.

Comment:

Examiner's Note: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.9

√ **Performance Step: 15** Total adjusted OCD tilt (A2+B8)

Standard: Examinee calculates the OCD to ICD conversion factor as follows:

NI5: +1.23 + 1.12 = 2.350

NI6: 2.28 + 2.468 = 4.749

NI7: 0.04 + 0.599 = 0.639

NI8: -0.63 + 0.852 = 0.221

Examinee enters the above solutions on Line B.9 of Attachment 7.1.

Comment:

OP-TM-300-202, Attachment 7.1, Step B.10

Performance Step: 16 Full Incore System Tilt limit per COLR Table 1.

Standard: Examinee reviews COLR Table 1 and determines that Full Incore System Steady State Limit for Power > 60% is 4.53 and enters 4.53 on Line B.10 of Attachment 7.1.

Comment:

Evaluator Note: **OP-TM-300-202, Step 4.5.1.5 is N/A**

OP-TM-300-202, Step 4.5.1.6 and/or OP-TM-300-202, Attachment 7.1, Step C.1

√ **Performance Step: 17** DETERMINE if the total adjusted OCD tilt exceeds the full incore limit IAW T.S. 3.5.2.4.b limit and COLR Table 1.

Standard: Examinee determines that NI6 total adjusted OCD tilt exceeds the COLR full incore limit of Table 1 and circles NO on Line C.1 of Attachment 7.1.

Comment:

Terminating Cue: **After the RO applicant has specified the tilt exceeds COLR limits: Evaluation on this JPM is complete.**

STOP TIME: ____________

Job Performance Measure No.: TMI 2014 NRC JPM RO A1-2

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

ATTACHMENT 7.1 KEY

A. REFERENCE TILT CONDITIONS

A1. Date/Time of last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements:
Yesterday / t = -33 Hours .

	NI5 (WX)	NI6 (YZ)	NI7 (XY)	NI8 (ZW)
A2. FIS0 = Incore Detector Tilt at Date/Time per A1 above.	1.23	2.28	0.04	-0.63
A3. OCD0 = Out-of-core Detector Tilt at Date/Time per A1 above.	-0.88	-0.06	0.25	-0.46

B. TILT MEASUREMENT CALCULATION

NOTE: This date must be less than 30 days from the reference date in A1.

B1. Date/Time of measurements: ______________/______________.

B2a. Present NI power	98.4	100.3	99.1	98.6
B2b. Average NI power (Sum of B2a)/4 - same number in all 4 blanks	99.1	99.1	99.1	99.1
B3. Indicated NI tilt =([NI Power /Average NI Power]-1)*100	(-0.70→-0.71)	(1.20→1.21)	0.000	(-.50→-.51)
B4. Change in indicated OCD tilt B3-A3	(0.17→0.18)	(1.26→1.27)	-0.25	(-0.04→-0.05)
B5. Recalibration correction	0	0	0	0

RECAL from Attachment 7.2 (= 0 if no recalibration has occurred)

B6. Power correction (0.73→0.74)(0.73→0.74)(0.73→0.74)(0.73→0.74)
IF: B1 -A1 < 24 hrs AND no NI recalibration has occurred, THEN Power correction = 0, OR = [0.731/(B2b/100)]

B7. Total adjustments = B4 + B5 + B6	0.911	2.008	0.487	0.692
NOTE: B7 Acceptable Ranges	(.812→1.012)	(1.908→2.108)	(.388→.588)	(.594→.794)
B8. OCD to ICD conversion factor application	(0.9→1.2)	(2.3→2.6)	(0.4→0.7)	(0.7→1.0)

= 1.23 * (B7) for no dropped rod
= 1.61 * (B7) if a dropped rod exists in any quadrant
(same factor applies for all quadrants)

B9. Total adjusted OCD tilt = A2 + B8 (2.2→2.5) (4.6→4.9) (0.5→0.8) (0.1→0.4)

B10. Full Incore System Tilt limit per COLR Table 1 4.53

C. EVALUATION

C1. The maximum value of B9 is less than the FIS Tilt limits in the COLR. (Circle one) Yes / No

ANSWER KEY –
DO NOT PROVIDE TO EXAMINEE

INITIAL CONDITIONS:

- The plant computer is not operational.
  - The computer has been off-line for 33 hours.
- Incore tilt was not exceeding the limits prior to the computer outage.
- No associated computer alarms were in prior to the computer outage.
- Recalibration of the NI's is not and has not been required.
- There are no dropped rods.
- All OCD's are operable.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements.
  - Calculator

INITIATING CUE:

Calculate quadrant power tilt IAW OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, based on the information provided.

TIME CRITICAL:

No

EXAMINEE DATA SHEET

FIS Incore Detector Tilt on: Date: Yesterday Time: 33 Hours Ago

NI-5 (WX)	+1.23
NI-6 (YZ)	+2.28
NI-7 (XY)	+0.04
NI-8 (ZW)	-0.63

OCD Out-of-Core Detector Tilt on: Date: Yesterday Time: 33 Hours Ago

NI-5 (WX)	-0.88
NI-6 (YZ)	-0.06
NI-7 (XY)	+0.25
NI-8 (ZW)	-0.46

PRESENT CORE POWER Date: TODAY Time: Now

NI-5 Core Power	98.4%
NI-6 Core Power	100.3%
NI-7 Core Power	99.1%
NI-8 Core Power	98.6%

Facility: TMI – Unit 1 Task No.: 22601001

Task Title: RCP Station Print Read JPM No.: 2014 NRC JPM RO A2

K/A Reference: 2.2.41 (3.5) New JPM

Examinee: NRC Examiner:

Facility Examiner: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- Reactor Power is 20%, 600 EFPD.
- RC-P-1A is Out of Service, not expected to return to service until repairs can be made during the next outage.
- RC-P-1D was tripped manually 14 hours ago and is ready to be restarted with the following conditions:
  - **The RC-P-1D-69, RC-P-1D Control Transfer Switch, has been placed in Bypass.**
  - **The 69 Selector Switch Contact #13 is stuck in the CLOSED position.**
  - **MU-V-33D, RC-P-1D Seal #1 Leak Off Isolation Valve, is closed with a damaged valve stem.**
  - **Fuse FD78 (XCC Fuse associated with RC-P-1D) has blown.**
- All other systems and components are in their normal configuration.

Task Standard:

- Determine RC-P-1D will not start from the Control Room and locally at the breaker.

Required Materials:

- Print 208-113, RC-P-1D, Rev 16
- Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4, Rev 4
- Print SS-209-127, Neutron Above 30% RC Pump Interlock, Rev 3
- Print D8032727, Reactor Control Sheet 2 of 2, Rev W
- Print 302-660, Makeup & Purification, Rev 45
- OP-TM-226-000, Reactor Coolant Pumps, Rev 8

General References:

- Print 208-113, RC-P-1D, Rev 16
- Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4, Rev 4
- Print SS-209-127, Neutron Above 30% RC Pump Interlock, Rev 3
- Print D8032727, Reactor Control Sheet 2 of 2, Rev W
- Print 302-660, Makeup & Purification, Rev 45
- Print 302-661, Make-up & Purification, Rev 60
- Print 209-070, D.C. And Miscellaneous, Rev 7
- Print 209-109, Aux. Relays for RC Pump A,B & D Instruments, Rev 0
- Print SS-208-350, Nuclear Service Closed Cooling Water Pumps NS-P1A To C Interlocks, Rev 3
- Print SS-209-065, Auxiliary Relays of: MU42-FS, Rev 8
- Print SS-208-114, 6900V Switchgear - Reactor Plant Bus 1A (1B) Undervoltage Relays & Potential Circuits, Rev 8
- OP-TM-226-000, Reactor Coolant Pumps, Rev 8

Handouts:

- Print 208-113, RC-P-1D, Rev 16
- Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4, Rev 4
- Print SS-209-127, Neutron Above 30% RC Pump Interlock, Rev 3
- Print D8032727, Reactor Control Sheet 2 of 2, Rev W
- Print 302-660, Makeup & Purification, Rev 45

Initiating Cue: While addressing all **bolded** conditions above and explaining why or why not, determine if RC-P-1D can be started either: **a)** from Console Center (using CS-1) or **b)** locally at its breaker. Fill in the provided table.

Time Critical Task: No

Validation Time: 30 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with an asterisk)

Start Time ___________

EXAMINER CUE: **Hand Examinee the following:**

- **Print 208-113, RC-P-1D**
- **Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4**
- **Print SS-209-127, Neutron Above 30% RC Pump Interlock**
- **Print D8032727, Reactor Control Sheet 2 of 2**
- **Print 302-660, Makeup & Purification**

Examiner Note: **RC-P-1D-69 in Bypass is addressed in this FIRST STEP. Refer to a marked up copy of the prints for contact positions.**

Examiner Note: **Bolded items below identify the critical portions of the step.**

Performance Step: 1 Determine if the 69 Bypass switch will allow RCP start from either Console Center or Locally when in BYPASS.

√ **Standard:**

- Using Print 208-113:
  - Examinee locates the 69 selector switch contact position table in section 5G and the 69 contacts located in various places on the print.
  - √ Examinee determines that, while the 69 Bypass switch is in the Bypass position, the RCP **can be started** from Console Center through 69 selector switch contacts 6 and 4 as long as all starting interlocks are met.

  AND

  - √ Examinee determines that, while the 69 Bypass switch is in the Bypass position, the RCP **can be started** locally through 69 selector switch contacts 2, 3, and 4 as long as all starting interlocks are met.

Comment:

Examiner Note: **RC-P-1D-69 Contact #13 is addressed in this SECOND STEP. Refer to a marked up copy of the prints for contact positions.**

Examiner Note: **Bolded item below identifies the critical portion of the step.**

Performance Step: 2 Determine if the 69 Bypass switch Contact #13 will allow RCP start from either Console Center or Locally when in BYPASS.

√ **Standard:**

- Using Print 208-113:
  - Examinee locates the 69 selector switch contact position table in section 5G.
  - Examinee determines that the 69 Bypass switch Contact #13 is a Spare Contact and has no effect on the circuitry.
  - √ Examinee determines that, while the 69 Bypass switch Contact #13 is closed, the RCP **can be started** from both Console Center and locally as long as all starting interlocks are met.

Comment:

Examiner Note: **MU-V-33D is addressed in this THIRD STEP. Refer to a marked up copy of the prints for contact positions.**

Examiner Note: **Bolded item below identifies the critical portion of the step.**

Performance Step: 3 Determine the impact of MU-V-33D being closed on starting RC-P-1D.

√ **Standard:**

- Using Print 302-660:
  - Examinee locates MU-V-33D in section1C.
  - Examinee determines that MU-13DPT-4 will read zero.
- Using Print 208-113:
  - Examinee determines that a starting interlock contact associated with MU-13DPS-4 is found on sheet SS-209-066.
- Using Print SS-209-066:
  - Examinee determines MU-13-DPS4 contact found in the far right branch of the main drawing will be open, deenergizing Relay 80XMU13-dPS4.
  - Examinee determines that the contact associated with 80XMU13-dPS4, found in the bottom right hand corner of the print, will be open. This is the same contact shown on Print 208-113.
- √ Examinee determines that the RCP Starting Interlock is not met and **it will prevent RC-P-1D from starting from either location.**

Comment:

Examiner Note: **Fuse FD78 is addressed in this FOURTH STEP. Refer to a marked up copy of the prints for contact positions.**

Examiner Note: **Bolded item below identifies the critical portion of the step.**

Performance Step: 4 Determine the impact of Fuse FD78 being blown on starting RC-P-1D.

√ **Standard:**

- Using Print SS-209-127:
  - Examinee locates FD78, found in the far right branch of the main drawing.
  - Examinee determines that Relay 90X/RCP1D will be deenergized.
  - Examinee determines that the contact associated with 90X/RCP1D, found in the bottom right hand corner of the print, will be open. This is the same contact shown on Print 208-113.
  - Examinee may refer to Print D8032727 to determine contact 86/NPL position.
- Using Print D8032727:
  - Examinee determines that the contact 86/NPL opens when neutron power is >30%. This would be the same result as a blown fuse.

√

- Examinee determines that, although less than 30% reactor power, the RCP Starting Interlock is not met and **it will prevent RC-P-1D from starting from either location.**

Comment:

Terminating Cue: **When the examinee has addressed all four bolded conditions, JPM may be terminated.**

STOP TIME: ______________

ANSWER KEY
DO NOT HAND TO STUDENTS

Item	RCP can or cannot be started from Console Center?	RCP can or cannot be started locally at the RCP breaker?
RC-P-1D-69 in Bypass	The RCP can be started from Console Center through 69 selector switch contacts 6 and 4.	The RCP can be started locally through 69 selector switch contacts 2, 3, and 4.
69 Selector Switch Contact #13 stuck closed	69 Bypass switch Contact #13 is a Spare Contact and has no effect on the circuitry. Therefore, the RCP can be started from Console Center.	69 Bypass switch Contact #13 is a Spare Contact and has no effect on the circuitry. Therefore, the RCP can be started locally.
MU-V-33D is closed with a damaged valve stem	MU-13-DPS4 contact will be open, deenergizing Relay 80XMU13-dPS4. The contact associated with 80XMU13-dPS4 will be open. Therefore, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting from Console Center.	MU-13-DPS4 contact will be open, deenergizing Relay 80XMU13-dPS4. The contact associated with 80XMU13-dPS4 will be open. Therefore, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting locally.
Fuse FD78 is blown	Relay 90X/RCP1D will be deenergized. The contact associated with 90X/RCP1D will be open. Contact 86/NPL opens when neutron power is >30%. This would be the same result as a blown fuse. Therefore, although less than 30% reactor power, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting from Console Center.	Relay 90X/RCP1D will be deenergized. The contact associated with 90X/RCP1D will be open. Contact 86/NPL opens when neutron power is >30%. This would be the same result as a blown fuse. Therefore, although less than 30% reactor power, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting locally.

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 TMI NRC JPM RO A2

Examinee's Name:

Date Performed:

Facility Examiner:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Reactor Power is 20%, 600 EFPD.
- RC-P-1A is Out of Service, not expected to return to service until repairs can be made during the next outage.
- RC-P-1D was tripped manually 14 hours ago and is ready to be restarted with the following conditions:
    - **The RC-P-1D-69, RC-P-1D Control Transfer Switch, has been placed in Bypass.**
    - **The 69 Selector Switch Contact #13 is stuck in the CLOSED position.**
    - **MU-V-33D, RC-P-1D Seal #1 Leak Off Isolation Valve, is closed with a damaged valve stem.**
    - **Fuse FD78 (XCC Fuse associated with RC-P-1D) has blown.**
- All other systems and components are in their normal configuration.

INITIATING CUE: While addressing all **bolded** conditions above and explaining why or why not, determine if RC-P-1D can be started either: **a)** from Console Center (using CS-1) or **b)** locally at its breaker. Fill in the provided table.

TIME CRITICAL: No

Item	RCP can or cannot be started from Console Center?	RCP can or cannot be started locally at the RCP breaker?
RC-P-1D-69 in Bypass	**(include contact numbers)**	**(include contact numbers)**
69 Selector Switch Contact #13 stuck closed	**(include reason why)**	**(include reason why)**
MU-V-33D is closed with a damaged valve stem	**(include reason why)**	**(include reason why)**
Fuse FD78 is blown	**(include reason why)**	**(include reason why)**

Facility:	TMI – Unit 1	Task No.:	OF010009
Task Title:	ERO Notification	JPM No.:	2014 NRC JPM RO A4
K/A Reference:	2.4.39 (3.9)	Modified JPM	

Examinee: NRC Examiner:

Facility Examiner: Date:

Method of testing:

Simulated Performance: X Actual Performance: ____

Classroom ____ Simulator X Plant ____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:
- A General Emergency has been declared.
- You are the Third Reactor Operator on shift.

Task Standard: Complete ERO notification via Everbridge system.

Required Materials: None

General References: EP-AA-112-100-F-06, ERO NOTIFICATION OR AUGMENTATION, Revision Q.

Handouts: EP-AA-112-100-F-06, ERO NOTIFICATION OR AUGMENTATION, Revision Q.

Initiating Cue: You are directed to call out the Three Mile Island Emergency Response Organization IAW EP-AA-112-100-F-06, ERO Notification or Augmentation.

Time Critical Task: Yes

Validation Time: 10 minutes

SIMULATOR SETUP

Utilize the CRS workstation for this JPM. Ensure the computer has internet access and the phone used for the ERO Notification is set up in the Simulator and is UNPLUGGED.

(Denote Critical Steps with an asterisk)

Start Time ___________

Examiner Cue: **When the examinee has located a copy of the procedure, then provide the Examinee a copy of EP-AA-112-100-F-06, ERO Notification or Augmentation.**

Performance Step: 1 Locate the Simulator phone for ERO Notification.

Standard:

- Examinee locates the Simulator phone for ERO Notification Phone at the CRS work station in the Simulator.
- Examinee locates the local copy of EP-AA-112-100-F-06, ERO Notification or Augmentation.

Comment:

Procedure Note: **The automated system will initiate the call out of management and bargaining unit personnel required to meet the ERO staffing requirements. Additional staffing of personnel shall be the responsibility of the individual Managers and Directors in the TSC / OSC / EOF / ENC /JIC following initial activation of those facilities.**

Section 1 - Initiate Activation / Termination of Notification System using World Wide Web

Section 2 - Initiate Activation / Termination of Notification System using live Everbridge Agent

Section 3 - Initiate Activation / Termination of Notification System using a Standard Phone

Section 4 – Initiate Alternate Pager Notification

Performance Step: 2

EP-AA-112-100-F-06, Step 1.1
CIRCLE the appropriate station specific Member ID and Station Password number from the table below.

Standard:

Examinee circles the following:
- TMI under Station
- 730143311 under Member ID
- 730143311 under Password

Comment:

Performance Step: 3

EP-AA-112-100-F-06, Step 1.2
CIRCLE the appropriate Activation / Termination Scenario Number for the event from the table below.

Standard:

Examinee circles the following:

Scenario 1 - Actual Event Respond to Facility - For Alert, Site Area, or General Emergency, or Security Events with On Site ERO reporting

Comment:

Performance Step: 4

EP-AA-112-100-F-06, Step 1.3
OPEN (double-click) the Everbidge Aware shortcut icon from your desktop computer. If shortcut Icon is not available or does not open, then ACCESS the World Wide Web and go to www.everbridge.net

Standard:

Examinee opens the Everbridge Aware shortcut from the desktop computer.

Comment:

EP-AA-112-100-F-06, Step 1.4

Performance Step: 5 ENTER the appropriate station specific Member ID and Password from Step 1.1 and SELECT (click) Go.

Standard:

- Examinee enters TMI as Station
- Examinee enters 730143311 as Member ID
- Examinee enters 730143311 as Password

Comment:

EP-AA-112-100-F-06, Step 1.5

Performance Step: 6 VERIFY the appropriate Station Name is displayed.

Standard: Examinee verifies TMI is displayed

Comment:

Examiner Note: **If the examinee selects scenario 1, an actual ERO callout will occur.**

- **DO NOT LET EXAMINEE SELECT SCENARIO 1.**
- **INSTRUCT EXAMINEE TO SELECT SCENARIO 11.**

EP-AA-112-100-F-06, Step 1.6

Performance Step: 7 SELECT (click) the appropriate scenario identified in Step 1.2.

Standard: Examinee selects Scenario 11

Comment:

EP-AA-112-100-F-06, Step 1.7

Performance Step: 8 VERIFY the appropriate scenario is displayed.

Standard: Examinee verifies Scenario 11 is displayed.

Comment:

Examiner Note: **Step 1.8 is N/A.**

EP-AA-112-100-F-06, Step 1.9

Performance Step: 9 If the scenario displayed is correct, then SELECT (click) Send Message.

Standard: Examinee determines that the scenario displayed is correct and selects "Send Message".

Comment:

EP-AA-112-100-F-06, Step 1.10

Performance Step: 10 VERIFY "Active Scenario Broadcasts" is displayed.

Standard: Examinee verifies "Active Scenario Broadcasts" is displayed.

Comment:

EP-AA-112-100-F-06, Step 1.11

Performance Step: 11 RECORD the time of the scenario broadcast.

Standard: Examinee records current time.

Comment:

EP-AA-112-100-F-06, Step 1.12

Performance Step: 12 SELECT "Log Out" to exit the Everbridge Aware Notification program.

Standard: Examinee selects "Log Out".

Comment:

EXAMINER CUE: **State: "Ten minutes has elapsed and no call to the Control Room has been received".**

EXAMINER NOTE: **Step 1.13 is N/A**

EP-AA-112-100-F-06, Step 1.14

Performance Step: 13 If a confirmation call is not received in the Control Room within 10 minutes confirming scenario activation, then proceed to Section 2, Initiate Activation / Termination of Notification System Using Live Everbridge Agent.

Standard: Examinee recognizes that a confirmation call has not been received and goes to Section 2.

Comment:

EXAMINER NOTE: **In step 2.1, the examinee may circle more information on the TMI line, but it is not required.**

EP-AA-112-100-F-06, Step 2.1

Performance Step: 14 CIRCLE the appropriate station specific Organization Name, Member ID, Response to Hint Question from the table below.

Standard: Examinee circles the following:

- Exelon – Three Mile Island under Organization Name
- 730143311 under Member ID
- Exelon under Response to Hint Question

Comment:

EP-AA-112-100-F-06, Step 2.2

Performance Step: 15 CIRCLE the appropriate Activation / Termination Scenario Number for the event from the table below.

Standard: Examinee circles the following:

- Scenario 1 - Actual Event Respond to Facility - For Alert, Site Area, or General Emergency, or Security Events with On Site ERO reporting.

Comment:

EXAMINER CUE: **State: "You hear a busy signal" when the examinee attempts to make a phone call in the next two steps.**

EP-AA-112-100-F-06, Step 2.3

Performance Step: 16 DIAL the ERO Notification System Activation phone number: 1-877-220- 4911.

Standard: Examinee dials 1-877-220-4911, recognizes that there is a busy signal, and continues on.

Comment:

EP-AA-112-100-F-06, Step 2.4

Performance Step: 17 If the number is busy or does not answer after a 2nd attempt, then PROCEED to Section 3 Initiate Activation / Termination of Notification System Using Standard Phone.

Standard: Examinee goes to Section 3.

Comment:

EP-AA-112-100-F-06, Step 3.1

Performance Step: 18 CIRCLE the appropriate station specific Member ID and Station Password number from the table below.

Standard: Examinee circles the following:
- TMI under Station
- 730143311 under Member ID
- 730143311 under Password

Comment:

EP-AA-112-100-F-06, Step 3.2

Performance Step: 19 CIRCLE the appropriate Activation / Termination Scenario Number for the event from the table below.

Standard: Examinee circles the following:
- Scenario 1 - Actual Event Respond to Facility - For Alert, Site Area, or General Emergency, or Security Events with On Site ERO reporting.

Comment:

EXAMINER CUE: **When the examinee attempts to make a phone call in the next step, state: "Welcome to EverBridge Aware. Please enter member ID followed by the pound SIGN".**

EP-AA-112-100-F-06, Step 3.3

Performance Step: 20 DIAL the Everbridge AWARE system activation phone number - 1-888-440-4911.

√ **Standard:** Examinee dials 1-888-440-4911.

Comment:

EXAMINER NOTE: **Steps 3.4 and 3.5 are N/A.**

EXAMINER CUE: **If the examinee enters a number other than 730143311#, then state: "Number not recognized".**

EP-AA-112-100-F-06, Step 3.6

Performance Step: 21 When the System prompts "Please enter member ID followed by the # sign" then ENTER the member ID followed by the "#" sign.

√ **Standard:** Examinee enters 730143311#

Comment:

EXAMINER CUE: **State: "Please enter your password followed by the pound BUTTON".**

EP-AA-112-100-F-06, Step 3.7

Performance Step: 22 When the system prompts "Please enter your Password followed by the # sign" then ENTER the Password followed by the "#" button.

√ **Standard:** Examinee enters 730143311#

Comment:

EXAMINER CUE: **State: "Press 3 to launch a broadcast scenario now".**

EP-AA-112-100-F-06, Step 3.8

Performance Step: 23 When prompted, PRESS 3 to launch a broadcast scenario now.

√ **Standard:** Examinee presses 3.

Comment:

EXAMINER CUE: **State: "Press 1 to select your scenario number".**

EP-AA-112-100-F-06, Step 3.9

Performance Step: 24 When prompted, PRESS 1 to select your scenario number

√ **Standard:** Examinee presses 1.

Comment:

EXAMINER CUE: **State: "Please enter your scenario number followed by the pound KEY".**

EP-AA-112-100-F-06, Step 3.10

Performance Step: 25 When the System states "Please enter your scenario number followed by the # key"

A. For "Actual Event with Response to Facility" PRESS 1 Then #
B. For "Unusual Event ERO Notification Only" PRESS 2 Then #
C. For "Actual Event Alternate Reporting Location" PRESS 3 Then #
D. For "Scenario Event Termination" PRESS 4 Then #
E. For "Scenario Activation Cancellation" PRESS 12 Then #

√ **Standard:** Examinee presses 1#

Comment:

EXAMINER CUE: **If entered correctly, state: "You have selected Scenario 1, actual event with response to facility. If this is correct, press pound, otherwise press star".**
If entered incorrectly, use performance step 25 to find the name of the scenario and state the name. The examinee should then press star and repeat performance step 25.

EP-AA-112-100-F-06, Step 3.11

Performance Step: 26 If the event name is correct, then PRESS #.

√ **Standard:** Examinee presses #.

Comment:

EXAMINER CUE: **State: "To launch this scenario now, press 1. To return to the previous menu, press 9. To end this call, simply hang up".**

EP-AA-112-100-F-06, Step 3.12

Performance Step: 27 The System will state "To launch this scenario now, press 1, to return to the previous menu, PRESS 9, to end this call, simply hang up. PRESS 1."

√ **Standard:** Examinee presses 1.

Comment:

EXAMINER CUE: **State: "Your scenario will be launched momentarily, results for this broadcast can be obtained by logging into Everbridge".**

EP-AA-112-100-F-06, Step 3.13

Performance Step: 28 When the activation is complete and the System states "Your scenario will be launched momentarily, results for this broadcast can be obtained by logging into Everbridge", then HANG UP the phone.

Standard: Examinee hangs up the phone

Comment:

EP-AA-112-100-F-06, Step 3.14

Performance Step: 29 RECORD the time of the scenario broadcast

Standard: Examinee records the current time.

Comment:

Terminating Cue: **When the time of the scenario broadcast has been recorded, JPM may be terminated.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 NRC JPM RO A4

Examinee's Name:

Date Performed:

Facility Examiner:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- A General Emergency has been declared.
- You are the Third Reactor Operator on shift.

INITIATING CUE:

You are directed to call out the Three Mile Island Emergency Response Organization IAW EP-AA-112-100-F-06, ERO Notification or Augmentation.

TIME CRITICAL:

Yes

Facility:	TMI – Unit 1	Task No.:	GOP002004
Task Title:	Review and approve an Estimated Critical Boron Concentration Calculation	JPM No.:	TMI 2014 NRC ADM JPM SRO A1-1
K/A Reference:	2.1.25 (4.2)	Modified from Bank JPM: TMI08 NRC JPM A1-1SRO	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- A sequential trip of both main feedwater pumps resulted in a reactor trip yesterday at 1000.
- The reactor is expected to return to critical at time T=+35 hours after the reactor trip.
- Reactor Power was 80%
- The unit had been on-line for 208 days.
- The last down power was 21 days ago.
- Cycle Burnup is 470 EFPD.
- TAVE = 532°F
- Current Boron Concentration = 1675 PPM
- The Desired Critical Rod Position is: 85% WD on CRG-6.
- The FINAL MIXED BORON DEPLETION CORRECTION FACTOR as specified in the control room log is .90
- No DTSQA-approved software is available for calculations.

Task Standard: Calculate an Estimated Critical Boron Concentration and find errors.

Required Materials:

- Calculator
- Ruler

General References: OP-TM-300-000, REACTIVITY AND POWER DISTRIBUTION CALCULATIONS, Rev. 5
OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION, Rev. 3

Handouts: OP-TM-300-000, REACTIVITY AND POWER DISTRIBUTION CALCULATIONS, Rev. 5
OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION, Rev. 3

Initiating Cue: You are the CRS. Review and Approve the calculated Estimated Critical Boron calculation IAW OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION.

Time Critical Task: No

Validation Time: 30 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR CUE: **Provide a clean copy of OP-TM-300-402 and a filled out Attachment 7.1 (found as an attachment to this JPM) to the Examinee**

OP-TM-300-402 Step 3.0

Performance Step: 1 Locates/reviews procedure Limits and Precautions.

Standard: The Examinee reviews LIMITS AND PRECAUTIONS.

Comment:

OP-TM-300-402, Step 4.1

Performance Step: 2 Perform calculations per Attachment 7.1 or DTSQA-approved software.

Standard: The Examinee determines from the initial conditions that DTSQA-approved software is not available and goes to Attachment 7.1.

Comment:

OP-TM-300-402 Attachment 7.1 Step 1

Performance Step: 3 Verify the average reactor coolant temperature, T_{AVE}, from the Initial Conditions.

Standard: The Examinee verifies T_{AVE} on Initial Conditions equals 532±2°F

Comment:

	OP-TM-300-402 Attachment 7.1 Step 2
Performance Step: 4	• Record Cycle Burnup.
Standard:	The Examinee determines 470 EFPD from Initial Conditions and verifies correct value on Line 2 of Attachment 7.1.
Comment:	
	OP-TM-300-402 Attachment 7.1 Step 3
Performance Step: 5	Record Current Measure Boron Concentration
Standard:	The Examinee determines 1675 ppm from Initial Conditions and verifies correct value on Line 3 of Attachment 7.1.
Comment:	
	OP-TM-300-402 Attachment 7.1 Step 4
Performance Step: 6	Record the Desired Critical Rod Positions
Standard:	The Examinee determines the desired critical rod position to be 85% withdrawn on CRG 6 from the initial conditions and recognizes the group positions as follows: CRG 1-4 100% WD CRG 5 100% WD CRG 6 85% WD CRG 7 10% WD The Examinee recognizes the following **discrepancy** on Line 4 of Attachment 7.1: Group 7 has incorrectly been recorded to be 0% WD.
Comment:	
	OP-TM-300-402 Attachment 7.1 Step 5
Performance Step: 7	Determine and record Fuel Excess Reactivity IAW Figure 2 of OP-TM-300-000
√ **Standard:**	The Examinee interprets Figure 2 and verifies (between 9.4% and 9.6%) $\Delta k/k$ has been recorded on Line 5 of Attachment 7.1.
Comment:	

Performance Step: 8

OP-TM-300-402 Attachment 7.1 Step 6
Determine and record the Desired Critical CRG 5-7 Reactivity Worth IAW Figure 5A of OP-TM-300-000

√ **Standard:**

The Examinee interprets Figure 5A and verifies (between -1.0% to -1.2%) dk/k has been recorded on Line 6 of Attachment 7.1.

Comment:

Performance Step: 9

OP-TM-300-402 Attachment 7.1 Step 7
Determine and record the Xenon Reactivity Worth IAW Figure 13 of OP-TM-300-000.

√ **Standard:**

The Examinee interprets Figure 13 and verifies (between -0.90% to -0.95%) dk/k has been recorded on Line 7 of Attachment 1.

√

The Examinee recognizes the following **discrepancy** on Line 7 of Attachment 7.1: Xenon Reactivity has incorrectly been recorded as -1.15%.

Comment:

Performance Step: 10

OP-TM-300-402 Attachment 7.1 Step 8
Determine and record the Samarium and Plutonium Buildup IAW Figure 15 of OP-TM-300-000.

√ **Standard:**

The examinee determines 35 hours since shutdown from initial conditions and verifies correct value on Line 8 of Attachment 7.1. The Examinee interprets Figure 15 and verifies (between -0.07% to -0.08%) dk/k has been recorded on Line 8 of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 9

Performance Step: 11 Calculate and record the Boron Reactivity Worth For Criticality Calculation.

√ **Standard:** The Examinee adds Lines 5 + 6 + 7 + 8 and determines the value (between 7.175% to 7.535%) dk/k should be recorded on Line 9 of Attachment 7.1

√ The Examinee recognizes the following **discrepancy** on Line 9 of Attachment 7.1: Boron Reactivity Worth has incorrectly been been recorded as +11.82%.

Comment:

OP-TM-300-402 Attachment 7.1 Step 10

Performance Step: 12 Determine and record the Inverse Boron Worth IAW Figure 8 of OP-TM-300-000.

√ **Standard:** The Examinee interprets Figure 8 and verifies (between 133.5 to 134.5) ppmB / %dk/k has been recorded on Line 10 of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 11a

Performance Step: 13 Calculate and record the Critical Boron Concentration

√ **Standard:** The Examinee multiplies lines 9 and 10 and determines (between 957.9 and 1013.5) ppmB should be recorded on Line 11a of Attachment 7.1.

√ The Examinee recognizes the following **discrepancy** on Line 11a of Attachment 7.1: Critical Boron Concentration has incorrectly been recorded (due to error carried forward).

Comment:

OP-TM-300-402 Attachment 7.1 Step 11b

Performance Step: 14 Record the Final Mixed Boron Depletion Correction Factor.

Standard: The Examinee determines 0.9 from Initial Conditions and verifies correct value on Line 11b of Attachment 7.1

Comment:

OP-TM-300-402 Attachment 7.1 Step 11c

Performance Step: 15 Calculate and record the Estimated Measured Critical Boron Concentration

Standard:

√ The Examinee divides line 11a by line 11b and determines (between 1064 and 1126) ppmB should be recorded on Line 11c of Attachment 7.1

√ The Examinee recognizes the following **discrepancy** on Line 11c of Attachment 7.1: Estimated Measured Critical Boron Concentration has incorrectly been recorded (due to error carried forward).

Comment:

OP-TM-300-402 Attachment 7.1 Step 12

Performance Step: 16 If this is a transient Xenon startup, then RECORD the interval that ECB is valid. Use the Xe value from Line 7 and a plot or table of Xe behavior with time. Estimate when Xe worth will be more or less negative than the value in Line 7 by 0.5% Δk/k.

Standard: The Examinee:

- o Determines that this is a transient Xenon startup.
- o Subtracts -0.5 Δk/k from -0.9 Δk/k. and comes up with -1.4 Δk/k.
- o Interprets Figure 13 and determines that -1.4 Δk/k. correlates with 28 hours after shutdown (27-29).
- o Determines that 28 hours after shutdown is 1400 today (1300-1500)
- o Subtracts +0.5 Δk/k from -0.9 Δk/k. and comes up with -0.4 Δk/k.
- o Interprets Figure 13 and determines that 0.4 Δk/k. correlates with 48 hours after shutdown (46-50).
- o Determines that 48 hours after shutdown is 1000 tomorrow (0800-1200)
- o Records the following on Line 12 of Attachment 7.1:
  - o "from" date as today.
  - o "from" time as calculated above.
  - o "to" date as tomorrow.
  - o "to" time as calculated above.

The Examinee recognizes the following **discrepancy** on Line 12 of Attachment 7.1: Line 12 has been N/A'd.

Comment:

OP-TM-300-402 Attachment 7.1

Performance Step: 17 Sign and add date/time

√ **Standard:** The Examinee does NOT sign and add the date and time at the bottom of Attachment 7.1.

Examinee returns the attachment unapproved.

Comment:

Terminating Cue: **When the candidate returns the completed Attachment 7.1 to the examiner: This JPM is complete.**

STOP TIME: ______________

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

OP-TM-300-402
Revision 3
Page 3 of 4

ATTACHMENT 7.1
Estimated Critical Boron Concentration Calculation Data Sheet
Page 1 of 1

NOTE: Refer to Attachment 7.2 to complete this data sheet. Data may be entered in any sequence. Sign-off verifies all data entered as required. Approval signature indicates an "Independent Verification".

CALCULATION IS FOR AN ECB AT DATE/TIME __Current Date / Time__

1. T_{AVE} (Assume T_{AVE} = 532 ± 2°F) __532__ °F
2. CYCLE BURNUP __470__ EFPD
3. CURRENT MEASURED BORON CONCENTRATION __1675__ ppmB
4. DESIRED CRITICAL ROD POSITION
   - CRG 1-4 __100__ % WD
   - CRG 5 __100__ % WD
   - CRG 6 __85__ % WD
   - CRG 7 ~~0~~ (10) % WD
5. FUEL EXCESS REACTIVITY (FIG 2) __9.4 to 9.6__ % Δk/k
6. DESIRED CRITICAL CRG 5-7 REACTIVITY WORTH (FIG 5A) __-1.0 to -1.2__ % Δk/k
7. XENON REACTIVITY WORTH (PPC, REACTOR ENGR., FIG 13) ~~-1.15~~ __(-0.85 to -0.95)__ % Δk/k
8. SAMARIUM AND PLUTONIUM BUILDUP (FIG 15)
   - TIME SINCE SHUTDOWN __35__ HRS
   - REACTIVITY DUE TO BUILDUP __-0.07 to -0.08__ % Δk/k
9. BORON REACTIVITY WORTH FOR CRITICALITY CALCULATION

   (5 + 6 + 7 + 8) = ~~+11.82~~ __(7.175 to 7.535)__ % Δk/k
10. INVERSE BORON WORTH (FIG 6) __133.5 to 134.5__ ppmB/% Δk/k
11. CRITICAL BORON CONCENTRATION

    11a. CRITICAL BORON CONCENTRATION (9 x 10) = __(957.9 to 1013.5)__ ~~1583.9~~ ppmB

    11b. FINAL MIXED BORON DEPLETION CORRECTION FACTOR (PPC, Control Room Log, Reactor Engineering) __0.9__

    11c. ESTIMATED MEASURED CRITICAL BORON CONCENTRATION (11 __(1064 to 1126)__ ~~1759.9~~ ppmB
12. If this is a transient Xenon startup, then RECORD the interval that ECB is valid

    From: Date/Time __~~N/A~~ Today / 1300-1500__ To: Date/Time __~~N/A~~ Tomorrow / 0800-1200__

CALCULATED BY: __Rich Megill__ DATE/TIME __Today / 1 Hr ago__

APPROVED BY (SRO): ____________ DATE/TIME ____________

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

VERIFICATION OF COMPLETION

Job Performance Measure No.: TMI 2014 NRC ADM JPM SRO A1-1

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Initial Conditions:

- A sequential trip of both main feedwater pumps resulted in a reactor trip yesterday at 1000.
- The reactor is expected to return to critical at time T=+35 hours after the reactor trip.
- Reactor Power was 80%
- The unit had been on-line for 208 days.
- The last down power was 21 days ago.
- Cycle Burnup is 470 EFPD.
- TAVE = 532°F
- Current Boron Concentration = 1675 PPM
- The Desired Critical Rod Position is: 85% WD on CRG-6.
- The FINAL MIXED BORON DEPLETION CORRECTION FACTOR as specified in the control room log is .90
- No DTSQA-approved software is available for calculations.

INITIATING CUE: You are the CRS. Review and Approve the calculated Estimated Critical Boron calculation IAW OP-TM-300-402, ESTIMATED CRITICAL BORON CONCENTRATION.

TIME CRITICAL: No

ATTACHMENT 7.1
Estimated Critical Boron Concentration Calculation Data Sheet
Page 1 of 1

NOTE: Refer to Attachment 7.2 to complete this data sheet. Data may be entered in any sequence. Sign-off verifies all data entered as required. Approval signature indicates an "Independent Verification".

CALCULATION IS FOR AN ECB AT DATE/TIME __Current Date / 1 Hour ago__

1. T_{AVE} (Assume T_{AVE} = 532 ± 2°F) __532__ °F
2. CYCLE BURNUP __470__ EFPD
3. CURRENT MEASURED BORON CONCENTRATION __1675__ ppmB
4. DESIRED CRITICAL ROD POSITION
   - CRG 1-4 __100__ % WD
   - CRG 5 __100__ % WD
   - CRG 6 __85__ % WD
   - CRG 7 __0__ % WD
5. FUEL EXCESS REACTIVITY (FIG 2) __9.5__ % Δk/k
6. DESIRED CRITICAL CRG 5-7 REACTIVITY WORTH (FIG 5A) __-1.1__ % Δk/k
7. XENON REACTIVITY WORTH (PPC, REACTOR ENGR., FIG 13) __-1.15__ % Δk/k
8. SAMARIUM AND PLUTONIUM BUILDUP (FIG 15)
   - TIME SINCE SHUTDOWN __35__ HRS
   - REACTIVITY DUE TO BUILDUP __-0.075__ % Δk/k
9. BORON REACTIVITY WORTH FOR CRITICALITY CALCULATION
   (5 + 6 + 7 + 8) = __+ 11.82__ % Δk/k
10. INVERSE BORON WORTH (FIG 6) __134.0__ ppmB/% Δk/k
11. CRITICAL BORON CONCENTRATION
    11a. CRITICAL BORON CONCENTRATION (9 x 10) = __1583.9__ ppmB
    11b. FINAL MIXED BORON DEPLETION CORRECTION FACTOR (PPC, Control Room Log, Reactor Engineering) __0.9__
    11c. ESTIMATED MEASURED CRITICAL BORON CONCENTRATION (11a / 11b) __1759.9__ ppmB
12. If this is a transient Xenon startup, then RECORD the interval that ECB is valid
    From: Date/Time __N/A__ To: Date/Time __N/A__

CALCULATED BY: __Rich Megill__ DATE/TIME __Current Date / 1 Hour ago__

APPROVED BY (SRO): ____________ DATE/TIME ____________

Facility:	TMI – Unit 1	Task No.:	AOP602001
Task Title:	Review OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, Calculation	JPM No.:	TMI 2014 NRC ADM JPM SRO A1-2
K/A Reference:	2.1.37 4.3 / 4.6		Facility Bank JPM 148 (Modified)

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom __X__ Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The plant computer is not operational.
  - The computer has been off-line for 33 hours.
- Incore tilt was not exceeding the limits prior to the computer outage.
- No associated computer alarms were in prior to the computer outage.
- Recalibration of the NI's is not and has not been required.
- There are no dropped rods.
- All OCD's are operable.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements.
  - Calculator

Task Standard: Calculate quadrant power tilt and identify critical errors.

Required Materials:
- COLR
- Calculator

General References:
- OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, Revision 2
- COLR
- Technical Specifications

An Attachment 7.1, OCD-ICD Tilt Correlation, KEY is attached to this JPM for evaluator use/information. Ensure that the KEY is NOT provided to the applicants.

Handout:
- OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM
- Filled out attachment 7.1 (attached behind the JPM CUE SHEET)
- Examinees Data Sheet (attached behind the JPM CUE SHEET) containing the current NI power level and recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements.

Initiating Cue: Review and approve the calculation for quadrant power tilt IAW OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, based on the information provided, and determine any applicable Tech Specs.

Time Critical Task: N/A

Validation Time: 25 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR NOTE: **Ensure that the KEY is NOT provided to the applicants.**

OP-TM-300-202, Step 4.1

Performance Step: 1 IAAT the PPC, FIDMS, and FIS are all operable, then EXIT this procedure.

Standard: Determines from the given initial conditions that the PPC is not operable and continues.

Comment:

OP-TM-300-202, Step 4.2

Performance Step: 2 IF all OCDs are operable, THEN PERFORM the following:

(1) DETERMINE tilt IAW Step 4.5.

Standard: Examinee goes to Step 4.5.

Comment:

PROCEDURE NOTE: **Tilt calculation must be performed once every 12 hours when the tilt alarm is inoperable.**

OP-TM-300-202, Step 4.5.1.1-4.5.1.2

Performance Step: 3 VERIFY computer alarms package for incore tilt was not in alarm immediately prior to loss of PPC, FIDMS, or FIS.

(1) IF the alarms package was in the alarm state, THEN TAKE action as necessary to address the alarm before proceeding in this procedure.

Standard: Verifies the computer alarms package was not in an alarm state immediately prior to the loss of computer.

Comment:

OP-TM-300-202, Step 4.5.1.3

√ **Performance Step: 4** RECORD last set of valid, steady state incore (FISo) and out-of-core (OCD_0) tilt measurements and the date and time the data was obtained on Attachment 7.1.

Standard: Examinee obtains the date and time that the data from the given data sheet and enters the data on Line A1 of Attachment 7.1.

Examinee obtains the FISo incore tilt measurements from the given data sheet and determines the following data should be recorded on Line A2 of Attachment 7.1:

NI-5 (WX)	+1.23
NI-6 (YZ)	+2.28
NI-7 (XY)	+0.04
NI-8 (ZW)	-0.63

Examinee obtains the OCD out-of-core tilt measurements from the given data sheet and determines the following data should be recorded on Line A3 of Attachment 7.1:

NI-5 (WX)	-0.88
NI-6 (YZ)	-0.06
NI-7 (XY)	+0.25
NI-8 (ZW)	-0.46

√ The Examinee recognizes the following **discrepancy** on Lines A2 and A3 of Attachment 7.1: FISo incore tilt measurements have been improperly entered on Line A3 and OCDo out-of-core tilt measurements have been improperly entered on Line A2.

Comment:

OP-TM-300-202, Step 4.5.1.4

Performance Step: 5 CALCULATE total tilt per Section B of Attachment 7.1 at least once every 12 hours (T. S. 3.5.2.4.g)

Standard: Goes to Section B of Attachment 7.1.

Comment:

PROCEDURE NOTE: **This date must be less than 30 days from the reference date in A1.**

OP-TM-300-202, Attachment 7.1, Step B.1

Performance Step: 6 Date/Time of measurements.

Standard: Determines the Date and Time and verifies the data has been recorded on Line B.1 of Attachment 7.1.

Comment:

OP-TM-300-202, Attachment 7.1, Step B.2a

Performance Step: 7 Present NI power.

Standard: Examinee obtains the Present NI power from the given data sheet and verifies the following data has been recorded on Line B.2a of Attachment 7.1:

NI-5 Core Power	98.4%
NI-6 Core Power	100.3%
NI-7 Core Power	99.1%
NI-8 Core Power	98.6%

Comment:

OP-TM-300-202, Attachment 7.1, Step B.2b

Performance Step: 8 Average NI power (Sum of B2a/4) - same number in all 4 blanks.

√ **Standard:** Examinee calculates Average NI power as follows:

$$(98.4 + 100.3 + 99.1 + 98.6) / 4 = 99.1$$

Examinee verifies 99.1 has been recorded four times on Line B.2b of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.3

Performance Step: 9 Indicated NI tilt ([NI power/Average NI power]-1)*100

√ **Standard:** Examinee calculates NI tilt for each NI as follows:

NI5: [(98.4 / 99.1) – 1] * 100 = -0.706

NI6: [(100.3 / 99.1) – 1] * 100 = +1.210

NI7: [(99.1 / 99.1) – 1] * 100 = 0.000

NI8: [(98.6 / 99.1) – 1] * 100 = -0.504

√ The Examinee recognizes the following **discrepancy** on Line B3 of Attachment 7.1: The negative sign is missing from NI8.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.4

Performance Step: 10 Change in indicated OCD tilt (B3-A3)

√ **Standard:** Examinee calculates the change in indicated OCD tilt as follows:

NI5: -0.706 - -0.88 = +0.174

NI6: +1.210 - -0.06 = +1.270

NI7: 0.000 – +0.25 = -0.250

NI8: -0.504 - -0.46 = -0.044

The Examinee recognizes the following **discrepancy** on Line B4 of Attachment 7.1: All four entries are wrong due to previous errors (Error carried forward).

Comment:

OP-TM-300-202, Attachment 7.1, Step B.5

Performance Step: 11 Recalibration correction [RECAL from Attachment 7.2 (=0 if no recalibration has occurred)]

Standard: Determines from initial conditions that no recalibration has occurred and verifies zero has been recorded on Line B.5 of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.6

Performance Step: 12 Power correction (If B1-A1<24 hrs and no NI calibration has occurred, then power correction = 0, or =[0.731/(B2b/100)])

√ **Standard:** Examinee calculates power correction as follows:

[0.731 / (99.1 / 100)] = 0.738

Examinee verifies 0.738 has been recorded four times on Line B.6 of Attachment 7.1.

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.7

Performance Step: 13 Total adjustments (B4+B5+B6)

√ **Standard:** Examinee calculates the total adjustments as follows:

NI5: +0.174 + 0.00 + 0.737 = 0.911

NI6: +1.270 + 0.00 + 0.737 = 2.008

NI7: -0.250 + 0.00 + 0.737 = 0.487

NI8: -0.044 + 0.00 + 0.737 = 0.692

The Examinee recognizes the following **discrepancy** on Line B7 of Attachment 7.1: All four entries are wrong due to previous errors (Error carried forward).

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.8

Performance Step: 14 OCD to ICD conversion factor [application (same factor applies for all quadrants) = 1.23*(B7) for no dropped rod, = 1.61*(B7) if a dropped rod exists in any quadrant]

√ **Standard:** Examinee:

- o Determines from the initial conditions that no dropped rod exists.
- o Calculates the OCD to ICD conversion factor as follows:
  - o NI5: 1.23 * 0.911 = 1.120
  - o NI6: 1.23 * 2.007 = 2.469
  - o NI7: 1.23 * 0.487 = 0.599
  - o NI8: 1.23 * 0.693 = 0.851

The Examinee recognizes the following **discrepancy** on Line B8 of Attachment 7.1: All four entries are wrong due to previous errors (Error carried forward).

Comment:

EXAMINER NOTE: **See answer key for acceptable ranges.**

OP-TM-300-202, Attachment 7.1, Step B.9

Performance Step: 15 Total adjusted OCD tilt (A2+B8)

√ **Standard:** Examinee calculates the OCD to ICD conversion factor as follows:

NI5: +1.23 + 1.12 = 2.350

NI6: 2.28 + 2.468 = 4.749

NI7: 0.04 + 0.599 = 0.639

NI8: -0.63 + 0.852 = 0.221

The Examinee recognizes the following **discrepancy** on Line B9 of Attachment 7.1: All four entries are wrong due to previous errors (Error carried forward).

Comment:

OP-TM-300-202, Attachment 7.1, Step B.10

Performance Step: 16 Full Incore System Tilt limit per COLR Table 1.

√ **Standard:** Examinee reviews COLR Table 1 and determines that Full Incore System Steady State Limit for Power > 60% is 4.53.

√ The Examinee recognizes the following **discrepancy** on Line B10 of Attachment 7.1: The wrong COLR limit has been recorded.

Comment:

EVALUATOR NOTE: **OP-TM-300-202, Step 4.5.1.5 is N/A**

OP-TM-300-202, Step 4.5.1.6 and/or OP-TM-300-202, Attachment 7.1, Step C.1

Performance Step: 17 DETERMINE if the total adjusted OCD tilt exceeds the full incore limit IAW T.S. 3.5.2.4.b limit and COLR Table 1.

√ **Standard:** Examinee determines that NI8 total adjusted OCD tilt exceeds the COLR full incore limit of Table 1 and that NO should be circled on Line C.1 of Attachment 7.1.

The Examinee recognizes the following **discrepancy** on Line C1 of Attachment 7.1: YES is circled (Error carried forward).

Comment:

OP-TM-300-202, Step 4.5.7

Performance Step: 18

If the total adjusted OCD tilt of any quadrant exceeds the limits for the full incore system, **then PERFORM** action per T.S. 3.5.2.4.d, e, and f as applicable.
T.S. 3.5.2.4.d, e, and f:

d. Except for physics tests if quadrant tilt exceeds the tilt limit, allowable power shall be reduced 2 percent for each 1 percent tilt in excess of the tilt limit. For less than four pump operation, thermal power shall be reduced 2 percent below the thermal power allowable for the reactor coolant pump combination for each 1 percent tilt in excess of the tilt limit.

e. If quadrant power tilt exceeds the tilt limit then within a period of 10 hours, the quadrant power tilt shall be reduced to less than the tilt limit except for physics tests, or the following verifications and/or adjustments in setpoints and limits shall be made:

1. Verify FQ (Z) and F ΔH are within limits of the COLR once per 2 hours and restore QPT to ≤ steady state limit within 24 hours, or perform steps 2, 3, & 4 below.
2. The protection system reactor power/imbalance envelope trip setpoints shall be reduced 2 percent in power for each 1 percent tilt, in excess of the tilt limit, or when thermal power is equal to or less than 50% full power with four reactor coolant pumps running, set the nuclear overpower trip setpoint equal to or less than 60% full power.
3. The control rod group withdrawal limits in the CORE OPERATING LIMITS REPORT shall be reduced 2 percent in power for each 1 percent tilt in excess of the tilt limit.
4. The operational imbalance limits in the CORE OPERATING LIMITS REPORT shall be reduced 2 percent in power for each 1 percent tilt in excess of the tilt limit.

f. Except for physics or diagnostic testing, if quadrant tilt is in excess of the maximum tilt limit defined in the CORE OPERATING LIMITS REPORT and using the applicable detector system defined in 3.5.2.4.a, b, and c above, reduce thermal power to ≤15% FP within 2 hours. Diagnostic testing during power operation with a quadrant tilt is permitted provided that the thermal power allowable is restricted as stated in 3.5.2.4.d above.

√ **Standard:** Decides that power needs to be reduced

Comment:

Terminating Cue: **After the examinee has specified the tilt exceeds COLR limits and that T.S. 3.5.2.4.d, e, and f apply: Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: TMI 2014 NRC ADM JPM SRO A1-2

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: __________________

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

NOTE: All 4 NIs must be operable to use this data sheet.

A. **Reference Tilt Conditions**

A1. Date/Time of last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements:
Yesterday / t = -33 Hours .

	NI5 (WX)	NI6 (YZ)	NI7 (XY)	NI8 (ZW)
A2. FIS_0	~~-0.88~~ 1.23	~~-0.06~~ +2.28	~~0.25~~ +0.04	~~-0.46~~ -0.63
A3. OCD_0	~~1.23~~ -0.88	~~2.28~~ -0.06	~~0.04~~ 0.25	~~-0.63~~ -0.46

B. **Tilt Measurement Calculation**

NOTE: This date must be less than 30 days from the reference date in A1.

B1. Date/Time of measurements: TODAY / NOW .

	NI5 (WX)	NI6 (YZ)	NI7 (XY)	NI8 (ZW)
B2a. Present NI power	98.4	100.3	99.1	98.6
B2b. Average NI power (Sum of B2a)/4 - same number in all 4 blanks	99.1	99.1	99.1	99.1
B3. Indicated NI tilt =([NI Power /Average NI Power]-1)*100	(-0.70→-0.71)	(1.20→1.21)	0.000	~~0.504~~ (-.50→-.51)
B4. Change in indicated OCD tilt B3-A3	~~-1.936~~ (0.17→0.18)	~~-1.07~~ (1.26→1.27)	~~0.04~~ -0.25	~~1.134~~ (-0.04→-0.05)
B5. Recalibration correction	0	0	0	0

RECAL from Data Sheet 2 (= 0 if no recalibration has occurred)

	NI5 (WX)	NI6 (YZ)	NI7 (XY)	NI8 (ZW)
B6. Power correction	(0.73→0.74)	(0.73→0.74)	(0.73→0.74)	(0.73→0.74)

IF: B1 -A1 < 24 hrs AND no NI recalibration has occurred, THEN Power correction = 0, OR = [0.731/(B2b/100)]

	NI5 (WX)	NI6 (YZ)	NI7 (XY)	NI8 (ZW)
B7. Total adjustments = B4 + B5 + B6	~~-1.198~~ (0.9→1.0)	~~-0.332~~ (1.9→2.1)	~~0.698~~ (0.4→0.5)	~~1.872~~ (0.6→0.7)
B8. OCD to ICD conversion factor Application (same factor applies…) = 1.23 * (B7) for no dropped rod = 1.61 * (B7) if a dropped rod exists in any quadrant	~~-1.47~~ (0.9→1.2)	~~-0.408~~ (2.3→2.6)	~~0.858~~ (0.4→0.7)	~~2.30~~ (0.7→1.0)
B9. Total adjusted OCD tilt = A2 + B8	~~-0.1~~ (2.2→2.5)	~~-0.468~~ (4.6→4.9)	~~1.108~~ (0.5→0.8)	~~1.84~~ (0.1→0.4)

B10. Full Incore System Tilt limit per COLR Table 1 ~~1.90~~ (4.53)

C. **Acceptance Criteria**

C1. The maximum value of B9 is less than the FIS Tilt limits in the COLR. (Circle one) Yes / No

C2. **If** the adjusted quadrant power tilt per C1 exceeds the limits in the COLR, **then PERFORM** action per T.S. 3.5.2.4d, e, and f as applicable.

ANSWER KEY – DO NOT PROVIDE TO EXAMINEE

INITIAL CONDITIONS:

- You are the CRS.
- The plant computer is not operational.
- The computer has been off-line for 33 hours.
- Incore tilt was not exceeding the limits prior to the computer outage.
- Recalibration of the NI's is not and has not been required.
- There are no dropped rods.
- All OCD's are operable.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements recorded.
  - A Calculator

INITIATING CUE:

Review and approve the calculation for quadrant power tilt IAW OP-TM-300-202, QUADRANT POWER TILT AND CORE IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM, based on the information provided, and determine any applicable Tech Specs.

TIME CRITICAL:

No

ATTACHMENT 7.1
OCD-ICD Tilt Correlation
Page 1 of 1

NOTE: All 4 NIs must be operable to use this data sheet.

A. **Reference Tilt Conditions**

A1. Date/Time of last recorded set of valid, steady state Full Incore System (FIS) and out-of-core detector (OCD) tilt measurements:
Yesterday / t = -33 Hours

	NI5 (WX)	NI6 (YZ)	NI7 (XY)	NI8 (ZW)
A2. FIS_0	-0.88	-0.06	0.25	-0.46
A3. OCD_0	1.23	2.28	0.04	-0.63

B. **Tilt Measurement Calculation**

NOTE: This date must be less than 30 days from the reference date in A1.

B1. Date/Time of measurements: TODAY / NOW .

B2a. Present NI power	98.4	100.3	99.1	98.6
B2b. Average NI power (Sum of B2a)/4 - same number in all 4 blanks	99.1	99.1	99.1	99.1
B3. Indicated NI tilt =([NI Power /Average NI Power]-1)*100	-0.706	1.210	0.000	0.504
B4. Change in indicated OCD tilt B3-A3	-1.936	-1.07	-0.04	1.134
B5. Recalibration correction	0	0	0	0

RECAL from Data Sheet 2 (= 0 if no recalibration has occurred)

B6. Power correction	0.738	0.738	0.738	0.738

IF: B1 -A1 < 24 hrs AND no NI recalibration has occurred, THEN Power correction = 0, OR = [0.731/(B2b/100)]

B7. Total adjustments = B4 + B5 + B6	-1.198	-0.332	0.698	1.872
B8. OCD to ICD conversion factor	-1.47	-0.408	0.858	2.30

Application (same factor applies for all quadrants)
= 1.23 * (B7) for no dropped rod
= 1.61 * (B7) if a dropped rod exists in any quadrant

B9. Total adjusted OCD tilt = A2 + B8	-0.1	-0.468	1.108	1.84

B10. Full Incore System Tilt limit per COLR Table 1 1.90

C. **Acceptance Criteria**

C1. The maximum value of B9 is less than the FIS Tilt limits in the COLR. (Circle one) Yes / No

C2. **If** the adjusted quadrant power tilt per C1 exceeds the limits in the COLR, **then PERFORM** action per T.S. 3.5.2.4d, e, and f as applicable.

Calculated by: ________ Date/Time Today/Now

SRO Review by: ________ Date/Time ________

EXAMINEE DATA SHEET

FIS Incore Detector Tilt on Date Yesterday Time 33 hrs ago

NI-5 (WX)	+1.23
NI-6 (YZ)	+2.28
NI-7 (XY)	+0.04
NI-8 (ZW)	-0.63

OCD Out-of-Core Detector Tilt on Date Yesterday Time 33 hrs ago

NI-5 (WX)	-0.88
NI-6 (YZ)	-0.06
NI-7 (XY)	+0.25
NI-8 (ZW)	-0.46

PRESENT CORE POWER Date TODAY Time NOW

NI-5 Core Power	98.4%
NI-6 Core Power	100.3%
NI-7 Core Power	99.1%
NI-8 Core Power	98.6%

Facility:	TMI – Unit 1	Task No.:	22601001
Task Title:	RCP Station Print Read	JPM No.:	2014 NRC JPM SRO A2
K/A Reference:	2.2.41 (3.9)		New JPM

Examinee: NRC Examiner:

Facility Examiner: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the CRS on shift.
- Reactor Power is 20%, 600 EFPD.
- RC-P-1A has been Out Of Service for 30 days, not expected to return to service until repairs can be made during the next outage.
- RC-P-1D was tripped manually 23 hours ago and is ready to be restarted with the following conditions:
  - **The RC-P-1D-69, RC-P-1D Control Transfer Switch, has been placed in Bypass.**
  - **The 69 Selector Switch Contact #13 is stuck in the CLOSED position.**
  - **MU-V-33D, RC-P-1D Seal #1 Leak Off Isolation Valve, is closed with a damaged valve stem.**
  - **Fuse FD78 (XCC Fuse associated with RC-P-1D) has blown.**
- All other systems and components are in their normal configuration.

Task Standard:

- Determine RC-P-1D will not start from the Control Room and locally at the breaker and the applicable Tech Specs that apply.

Required Materials:

- Print 208-113, RC-P-1D, Rev 16
- Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4, Rev 4
- Print SS-209-127, Neutron Above 30% RC Pump Interlock, Rev 3
- Print D8032727, Reactor Control Sheet 2 of 2, Rev W
- Print 302-660, Makeup & Purification, Rev 45
- OP-TM-226-000, Reactor Coolant Pumps, Rev 8
- Tech Specs

General References:

- Print 208-113, RC-P-1D, Rev 16
- Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4, Rev 3
- Print SS-209-127, Neutron Above 30% RC Pump Interlock, Rev 3
- Print D8032727, Reactor Control Sheet 2 of 2, Rev W
- Print 302-660, Makeup & Purification, Rev 45
- Print 302-661, Make-up & Purification, Rev 60
- Print 209-070, D.C. And Miscellaneous, Rev 7
- Print 209-109, Aux. Relays for RC Pump A,B & D Instruments, Rev 0
- Print SS-208-350, Nuclear Service Closed Cooling Water Pumps NS-P1A To C Interlocks, Rev 3
- Print SS-209-065, Auxiliary Relays of: MU42-FS, Rev 8
- Print SS-208-114, 6900V Switchgear - Reactor Plant Bus 1A (1B) Undervoltage Relays & Potential Circuits, Rev 8
- OP-TM-226-000, Reactor Coolant Pumps, Rev 8
- Tech Specs

Handouts:

- Print 208-113, RC-P-1D, Rev 16
- Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4, Rev 3
- Print SS-209-127, Neutron Above 30% RC Pump Interlock, Rev 3
- Print D8032727, Reactor Control Sheet 2 of 2, Rev W
- Print 302-660, Makeup & Purification, Rev 45

Initiating Cue: While addressing all **bolded** conditions above and explaining why or why not, determine if RC-P-1D can be started either: **a)** from Console Center (using CS-1) or **b)** locally at its breaker. Address applicable Tech Spec concerns, if any. Fill in the provided table.

Time Critical Task: No

Validation Time: 30 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with an asterisk)

Start Time ___________

EXAMINER CUE: **Hand Examinee the following:**

- **Print 208-113, RC-P-1D**
- **Print SS-209-066, Aux Relays of MU-13-DPS1,2,3 & 4**
- **Print SS-209-127, Neutron Above 30% RC Pump Interlock**
- **Print D8032727, Reactor Control Sheet 2 of 2**
- **Print 302-660, Makeup & Purification**

EXAMINER NOTE: **RC-P-1D-69 in Bypass is addressed in this FIRST STEP. Refer to a marked up copy of the prints for contact positions.**

EXAMINER NOTE: **Bolded items below identify the critical portions of the step.**

Performance Step: 1 Determine if the 69 Bypass switch will allow RCP start from either Console Center or Locally when in BYPASS.

√ **Standard:**

- Using Print 208-113:
  - Examinee locates the 69 selector switch contact position table in section 5G and the 69 contacts located in various places on the print.
  - √ Examinee determines that, while the 69 Bypass switch is in the Bypass position, the RCP **can be started** from Console Center through 69 selector switch contacts 6 and 4 as long as all starting interlocks are met.

  AND

  - √ Examinee determines that, while the 69 Bypass switch is in the Bypass position, the RCP **can be started** locally through 69 selector switch contacts 2, 3, and 4 as long as all starting interlocks are met.

Comment:

EXAMINER NOTE: **RC-P-1D-69 Contact #13 is addressed in this SECOND STEP. Refer to a marked up copy of the prints for contact positions.**

EXAMINER NOTE: **Bolded items below identify the critical portions of the step.**

Performance Step: 2 Determine if the 69 Bypass switch Contact #13 will allow RCP start from either Console Center or Locally when in BYPASS.

√ **Standard:**

- Using Print 208-113:
  - Examinee locates the 69 selector switch contact position table in section 5G.
  - Examinee determines that the 69 Bypass switch Contact #13 is a Spare Contact and has no effect on the circuitry.
  - √ Examinee determines that, while the 69 Bypass switch Contact #13 is closed, the RCP **can be started** from both Console Center and locally as long as all starting interlocks are met.

Comment:

EXAMINER NOTE: **MU-V-33D is addressed in this THIRD STEP. Refer to a marked up copy of the prints for contact positions.**

EXAMINER NOTE: **Bolded items below identify the critical portions of the step.**

Performance Step: 3 Determine the impact of MU-V-33D being closed on starting RC-P-1D.

√ **Standard:**

- Using Print 302-660:
  - Examinee locates MU-V-33D in section1C.
  - Examinee determines that MU-13DPT-4 will read zero.
- Using Print 208-113:
  - Examinee determines that a starting interlock contact associated with MU-13DPS-4 is found on sheet SS-209-066.
- Using Print SS-209-066:
  - Examinee determines MU-13-DPS4 contact found in the far right branch of the main drawing will be open, deenergizing Relay 80XMU13-dPS4.
  - Examinee determines that the contact associated with 80XMU13-dPS4, found in the bottom right hand corner of the print, will be open. This is the same contact shown on Print 208-113.

√

- Examinee determines that the RCP Starting Interlock is not met and **it will prevent RC-P-1D from starting from either location.**

Comment:

EXAMINER NOTE: **Fuse FD78 is addressed in this FOURTH STEP. Refer to a marked up copy of the prints for contact positions.**

EXAMINER NOTE: **Bolded items below identify the critical portions of the step.**

Performance Step: 4 Determine the impact of Fuse FD78 being blown on starting RC-P-1D.

√ **Standard:**

- Using Print SS-209-127:
  - Examinee locates FD78, found in the far right branch of the main drawing.
  - Examinee determines that Relay 90X/RCP1D will be deenergized.
  - Examinee determines that the contact associated with 90X/RCP1D, found in the bottom right hand corner of the print, will be open. This is the same contact shown on Print 208-113.
  - Examinee may refer to Print D8032727 to determine contact 86/NPL position.
- Using Print D8032727:
  - Examinee determines that the contact 86/NPL opens when neutron power is >30%. This would be the same result as a blown fuse.

√

- Examinee determines that, although less than 30% reactor power, the RCP Starting Interlock is not met and **it will prevent RC-P-1D from starting from either location.**

Comment:

Examiner Note: **Tech Specs are addressed in this FIFTH STEP.**

Performance Step: 5 Determine applicable Tech Spec, if any.

√ **Standard:**

- Examinee reviews Tech Spec 3.1.1.1: Reactor Coolant Pumps

a) Pump combinations permissible for given power levels shall be as shown in Specification Table 2.3.1.

  - Table 2.3.1: One Reactor Coolant Pump Operating in Each Loop (Nominal Operating Power - 49%)

b) Power operation with one idle reactor coolant pump in each loop shall be restricted to 24 hours. If the reactor is not returned to an acceptable RC pump operating combination at the end of the 24-hour period, the reactor shall be in a hot shutdown condition within the next 12 hours.

- Examinee determines that current reactor power is not a Tech Spec violation.

√
- Examinee determines that since it has been 20 hours that both RC-P-1A and RC-P-1D have been secured and it will be an additional 12 hours until MU-V-33D will be repaired; a reactor shutdown to a Hot Shutdown condition must be commenced in the next 4 hours.

Comment:

Terminating Cue: **When the examinee has addressed all four bolded conditions and states whether a Tech Spec applies or not, JPM may be terminated.**

STOP TIME: ______________

ANSWER KEY

DO NOT HAND TO STUDENTS

Item	RCP can or cannot be started from Console Center?	RCP can or cannot be started locally at the RCP breaker?
RC-P-1D-69 in Bypass	The RCP can be started from Console Center through 69 selector switch contacts 6 and 4.	The RCP can be started locally through 69 selector switch contacts 2, 3, and 4.
69 Selector Switch Contact #13 stuck closed	69 Bypass switch Contact #13 is a Spare Contact and has no effect on the circuitry. Therefore, the RCP can be started from Console Center.	69 Bypass switch Contact #13 is a Spare Contact and has no effect on the circuitry. Therefore, the RCP can be started locally.
MU-V-33D is closed with a damaged valve stem	MU-13-DPS4 contact will be open, deenergizing Relay 80XMU13-dPS4. The contact associated with 80XMU13-dPS4 will be open. Therefore, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting from Console Center.	MU-13-DPS4 contact will be open, deenergizing Relay 80XMU13-dPS4. The contact associated with 80XMU13-dPS4 will be open. Therefore, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting locally.
Fuse FD78 is blown	Relay 90X/RCP1D will be deenergized. The contact associated with 90X/RCP1D will be open. Contact 86/NPL opens when neutron power is >30%. This would be the same result as a blown fuse. Therefore, although less than 30% reactor power, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting from Console Center.	Relay 90X/RCP1D will be deenergized. The contact associated with 90X/RCP1D will be open. Contact 86/NPL opens when neutron power is >30%. This would be the same result as a blown fuse. Therefore, although less than 30% reactor power, the RCP Starting Interlock is not met and it will prevent RC-P-1D from starting locally.

T.S. Applicability, if any:

Table 2.3.1: One Reactor Coolant Pump Operating in Each Loop (Nominal Operating Power - 49%)

c) Power operation with one idle reactor coolant pump in each loop shall be restricted to 24 hours. If the reactor is not returned to an acceptable RC pump operating combination at the end of the 24-hour period, the reactor shall be in a hot shutdown condition within the next 12 hours.

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 TMI NRC JPM SRO A2

Examinee's Name:

Date Performed:

Facility Examiner:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are the CRS on shift.
- Reactor Power is 20%, 600 EFPD.
- RC-P-1A has been Out Of Service for 30 days, not expected to return to service until repairs can be made during the next outage.
- RC-P-1D was tripped manually 23 hours ago and is ready to be restarted with the following conditions:
  - **The RC-P-1D-69, RC-P-1D Control Transfer Switch, has been placed in Bypass.**
  - **The 69 Selector Switch Contact #13 is stuck in the CLOSED position.**
  - **MU-V-33D, RC-P-1D Seal #1 Leak Off Isolation Valve, is closed with a damaged valve stem.**
  - **Fuse FD78 (XCC Fuse associated with RC-P-1D) has blown.**
- All other systems and components are in their normal configuration.

INITIATING CUE:

While addressing all **bolded** conditions above and explaining why or why not, determine if RC-P-1D can be started either: **a)** from Console Center (using CS-1) or **b)** locally at its breaker. Address applicable Tech Spec concerns, if any. Fill in the provided table.

TIME CRITICAL: No

Item	RCP can or cannot be started from Console Center?	RCP can or cannot be started locally at the RCP breaker?
RC-P-1D-69 in Bypass	**(include contact numbers)**	**(include contact numbers)**
69 Selector Switch Contact #13 stuck closed	**(include reason why)**	**(include reason why)**
MU-V-33D is closed with a damaged valve stem	**(include reason why)**	**(include reason why)**
Fuse FD78 is blown	**(include reason why)**	**(include reason why)**
T.S. Applicability, if any:		

Facility:	TMI – Unit 1	Task No.:	SGT02002
Task Title:	Implement the Requirements of ODCM for RMS Operability	JPM No.:	2014 NRC JPM SRO A3
K/A Reference:	2.3.15 (3.1)	Modified from TMI08 NRC JPM A3 SRO	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the CRS.
- The plant is at 100% power
- RM-A-8 Gas Channel is OOS for replacement of the indicator.
- CA-G-1A, Beckman H2/O2 Gas Analyzer, is OOS, awaiting parts.
- Waste Gas Tank WDG-T-1C is being released IAW 6610-4250-11, Releasing Radioactive Gaseous Effluents- Waste Gas Tanks A/B/C.
- The ARO informs you of the following reports:
    - RM-A-6 Gas channel has failed low.
    - 120/208V AC Distribution Panel AB-3 (SS-201-149) has deenergized.
- All other plant equipment is operating properly.

Task Standard: ODCM Requirements for RMS Operability identified.

Required Materials: None

General References:	CY-TM-170-300, Offsite Dose Calculation Manual (ODCM), Rev. 3 6610-ADM-4250.11, Releasing Radioactive Gaseous Effluents- Waste Gas Tanks A/B/C, Rev. 14A 6610-ADM-4250.10, Radiological Controls/Chemistry Actions When RMS Malfunctions, Rev 16. 1107-4, Electrical Distribution Panel Listing, Rev 225.
Handouts:	CY-TM-170-300, Offsite Dose Calculation Manual (ODCM), Rev. 3
Initiating Cue:	Identify actions required to be taken for the given conditions.
Time Critical Task:	No
Validation Time:	10 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator Cue: **When/if asked for, provide a copy of:**

- **ODCM**
- **6610-ADM-4250.11, Releasing Radioactive Gaseous Effluents- Waste Gas Tanks A/B/C**
- **6610-ADM-4250.10, Radiological Controls/Chemistry Actions When RMS Malfunctions**
- **1107-4, Electrical Distribution Panel Listing**

Performance Step: 1 Identifies entry into the ODCM is required.

Standard: The Examinee determines entry into the ODCM is required.

Comment:

ODCM 2.1.2 Radioactive Gaseous Process and Effluent Monitoring Instrumentation

Performance Step: 2 Enters ODCM 2.1.2 Radioactive Gaseous Process and Effluent Monitoring Instrumentation

Standard: The Examinee recognizes applicability of section 2.1.2.b:

> With less than the minimum number of radioactive gaseous process or effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in table 2.1-2. Exert best efforts to return the instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Annual Effluent Release Report why the inoperability was not corrected in a timely manner.

Evaluator Cue: **Acknowledge the report.**

Comment:

ODCM Table 2.1-2 Radioactive Gaseous Process and Effluent Monitoring Instrumentation

Performance Step: 3 The Examinee enters the ODCM Table 2.1-2 to determine operability requirements.

Standard: The Examinee determines:

- That CA-G-1B is inoperable when Distribution Panel AB-3 is deenergized.
- That the Waste Gas Tank release may continue as long as a grab sample is collected and analyzed for H_2 and O_2 at least once per 24 hours IAW the Table Notation applicability and ACTION 30 associated with CA-G-1A and CA-G-1B being inoperable.

√

Table 2.1-2

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

INSTRUMENT	MINIMUM CHANNEL OPERABLE	APPLICABILITY	ACTION
1. Waste Gas Holdup System			
a. Noble Gas Activity Monitor (RM-A-7)	1	***	25
B. Effluent System Flow Rate Measuring Device (WDG-FT-123)	1	***	26
2. Waste Gas Holdup System Explosive Gas Monitoring System			
a. Hydrogen Monitor (CA-G-1A/B)	2	**	30
b. Oxygen Monitor (CA-G-1A/B)	2	**	30

ACTION 30 1. With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, a grab sample shall be collected and analyzed for the inoperable gas channel(s) at least once per 24 hours. With both channels inoperable, a grab sample shall be collected and analyzed for the inoperable gas channel(s):

(a) at least once per 4 hours during degassing operations.

(b) at least once per 24 hours during other operations (e.g. Feed and Bleed).

2. If the inoperable gas channel(s) is not restored to service within 14 days, a special report shall be submitted to the Regional Administrator of the NRC Region I Office and a copy to the Director, Office of Inspection and Enforcement within 30 days of declaring the channel(s) inoperable. The report shall describe (a) the cause of the monitor inoperability, (b) action being taken to restore the instrument to service, and (c) action to be taken to prevent recurrence.

Comment:

ODCM Table 2.1-2

Performance Step: 4 Determine actions required for Auxiliary Building ventilation with RM-A-6G and RM-A-8G inoperable.

√ **Standard:** The Examinee reviews the ODCM Table 2.1-2, ACTION 27 for RM-A-8G and RM-A-6G being inoperable and determines releases via the Auxiliary Building ventilation exhaust may continue provided that gas grab samples are taken at least once per twelve (12) hours, and that the initial sample is analyzed by gamma scan within 24 hours after the channel has been declared inoperable.

Table 2.1-2 (Cont'd)

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

INSTRUMENT	MINIMUM CHANNEL OPERABLE	APPLICABILITY	ACTION
5. Auxiliary and Fuel Handling Building Ventilation System			
a. Noble Gas Activity Monitor (RM-A-8) or (RM-A-4 and RM-A-6)	1	*	27
b. Iodine Sampler (RM-A-8 or (RM-A-4 and RM-A-6)	1	*	31
c. Particulate Sampler (RM-A-8 or (RM-A-4 and RM-A-6)	1	*	31
d. Effluent System Flow Rate Measuring Devices (AH-FR-149 and AH-FR-150)	1	*	26
e. Sampler Flow Rate Monitor (RM-FI-1230 or RM-A-4\FI and RM-A-6\FI)	1	*	26

ACTION 27 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and the initial samples are analyzed for gross activity (gamma scan) within 24 hours after the channel has been declared inoperable. If RM-A-9 is declared inoperable, see also Technical Specification 3.5.1, Table 3-5.1, Item C.3.f.

Comment:

Terminating Cue: **When the Examinee completes the call on Auxiliary Building ventilation the JPM may be terminated.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 TMI NRC JPM SRO A3

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are the CRS.
- The plant is at 100% power
- RM-A-8 Gas Channel is OOS for replacement of the indicator.
- CA-G-1A, Beckman H2/O2 Gas Analyzer, is OOS, awaiting parts.
- Waste Gas Tank WDG-T-1C is being released IAW 6610-4250-11, Releasing Radioactive Gaseous Effluents- Waste Gas Tanks A/B/C.
- The ARO informs you of the following reports:
    - RM-A-6 Gas channel has failed low.
    - 120/208V AC Distribution Panel AB-3 (SS-201-149) has deenergized.
- All other plant equipment is operating properly.

INITIATING CUE: Identify actions required to be taken for the given conditions.

TIME CRITICAL: No

Facility:	TMI Unit 1	Task No.:	OF010009
Task Title:	Given a set of conditions, determine the Emergency Action Level (EAL) and make a Protective Action Recommendation (PAR) IAW the facility Emergency Plan.	JPM No.:	2014 NRC JPM SRO A4
K/A Reference:	2.4.44 (4.4)	New for 2014 NRC JPM	

To be conducted one on one.

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- T= 0700:
  - Plant is at 100% Power.
  - Weather: Rain. Temp: 60°F. Wind: from 120° at 6 mph.
- T= 0701:
  - OBE Earthquake Alarm PRF-1-3 actuates.
  - An 11 gpm tube leak occurs in the "A" OTSG.
  - A 7 gpm tube leak occurs in the "B" OTSG.
- T= 0703:
  - An aftershock occurs.
  - Turbine Trip with an ATWS, Manual Reactor Trip was **NOT** successful due to multiple stuck rods.
  - An RCS leak occurs at the suction of RC-P-1C of 300gpm.
  - 4 psig ES actuation occurs.
  - MS-V-4A (ADV) sticks open and the MS-V-15A (MS-V-4A isolation) handwheel breaks off while still open.
- T= 0705 (**current time**):
  - Another aftershock causes the RCS leak to rise to 500gpm.
  - Containment Radiation levels on RM-A-22/23 indicate 2000 R/hr in Containment.

Task Standard: Identifies EAL and PAR.

Required Materials: Perform in a location with:
- o EAL Matrix
- o Shift Emergency Director Book

General References:
- EP-AA-111, EMERGENCY CLASSIFICATION AND PROTECTIVE ACTION RECOMMENDATIONS, Revision 18
- EP-AA-111-F-09, TMI PLANT BASED PAR FLOWCHART, Revision E
- EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST, Revision S
- EP-AA-112-F-09, EMERGENCY PUBLIC ADDRESS ANNOUNCEMENTS, Revision D
- EP-MA-114-100-F-01, STATE/LOCAL EVENT NOTIFICATION FORM, Revision N
- EP-AA-1009 EXELON NUCLEAR RADIOLOGICAL EMERGENCY PLAN ANNEX FOR THREE MILE ISLAND (TMI) STATION Revision 21
- EP-AA-112-100-F-06 ERO NOTIFICATION OR AUGMENTATION Revision Q.
- EP-AA-114-F-01 PWR RELEASE IN PROGRESS DETERMINATION GUIDANCE, Revision E
- EP-MA-114-100, MID-ATLANTIC STATE/LOCAL NOTIFICATIONS, Revision 20

Handouts:
- EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST, signed off for the declared alert.
- Emergency Director Binder

Initiating Cue:
- You are the Shift Manager. I will act as your communicator. Declare the appropriate EAL and respond in accordance with the EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST.

Time Critical Task: Yes

Validation Time: 20 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check)

EVALUATOR CUE: **The Time Critical Start Time is when the Cue is acknowledged.**

#1 Time Critical Start Time: __________

Performance Step: 1 Compares conditions to the EAL Table.

Standard: Examinee:

- Determines Fuel Clad has been lost based on Containment radiation (RM-G-22 or RM-G-23) reading > 1.95E+03 R/hr.
- Determines Reactor Coolant System has been lost based on Containment radiation (RM-G-22 or RM-G-23) reading > 25 R/hr.
- Determines Primary Containment Barrier has been lost based on Primary-to-Secondary leak rate > 10 gpm and UNISOLABLE steam release from affected S/G to the environment.

√

- Determines conditions are met for GENERAL EMERGENCY EAL FG1.

Comment:

EP-AA-112-100-F-01

Performance Step: 2 Locate and Implement EP-AA-112-100-F-01 for GE.

Standard:

- Examinee locates EP-AA-112-100-F-01.
- Examinee determines that Section 1.4 is to be implemented for General Emergency Initial Actions.

Comment:

EP-AA-112-100-F-01, Step 1.4.A

Performance Step: 3 Announce the event classification, possible escalation paths, and declaration time to the Control Room staff.

√ **Standard:** Announces GE based on Loss of Fuel Clad, Loss of RCS, and a Loss of Containment.

Comment:

EVALUATOR NOTE: **The #1 Time Critical Stop Time is when the General Emergency is declared.**

#1 Time Critical Stop Time: ___________

EVALUATOR NOTE: **Time Critical #1 must be equal to or less than 15 minutes.**

Time Critical #1= **(#1 Time start)** ________

(Time of declaration) - ________

= ________ **mins**

EP-AA-112-100-F-01, Step 1.4.B

Performance Step: 4 Record the EAL, threshold(s) (as applicable) and declaration time.

Standard: Examinee records EAL FG1 on EP-AA-112-100-F01.

Examinee records thresholds FC7, RC7, and CT5 on EP-AA-112-100-F01.

Examinee records the time of declaration on EP-AA-112-100-F01.

Comment:

EVALUATOR NOTE: **Step 1.4C is N/A.**

EVALUATOR CUE: **Repeat any direction given to you with regards to EP-AA-112-F-09.**

EP-AA-112-100-F-01, Step 1.4.D

Performance Step: 5 SELECT the Emergency Public Address Announcements from the form and DIRECT performance of the public address announcement within 15 minutes of event classification.

Standard: Examinee fills out EP-AA-112-F-09 (found at tab 1), section 4.2.B, and hands to communicator (NRC examiner) to make the announcement.

Comment:

EVALUATOR CUE: **Repeat any direction given to you with regards to EP-AA-112-100-F-06.**

EVALUATOR CUE: **If requested to provide DAPAR information, then respond "Offsite dose projections are < 1 REM TEDE and < 5REM CDE thyroid".**

EP-AA-112-100-F-01, Step 1.4.E

Performance Step: 6 If the ERO has not been activated, then DIRECT activation of the ERO Notification using Scenario 1, "Actual Event Respond to Facility," or Scenario 3, "Actual Event Alternate Reporting Location," as appropriate, per EP-AA-112-100-F-06.

Standard: Examinee hands out EP-AA-112-100-F-06 and directs activation of the ERP notification using Scenario 1.

Comment:

EP-AA-112-100-F-01, Step 1.4.F

Performance Step: 7 Determine the PAR per the Emergency Classification and Protective Action Recommendations procedure.

- Emergency Classification and PAR Procedure: Tab 6
- Plant Based PAR Flowchart: Tab 7

√ **Standard:** Examinee follows the flowchart of EP-AA-111-F-09 as follows:

- Classification is a General Emergency? – **Yes**
- Is this the Initial PAR? – **Yes**
- Release via Controlled direct containment vent with a duration < 1 hour?– **No**
- Is there a Hostile Action Event in progress?– **No**
- Has the utility been informed by the State that there are impediments to evacuation?– **No**

Examinee determines the following actions are required:

- Evacuate 5 – mile radius.

Evaluate Dose Assessment results to determine if a PAR upgrade is required.

Comment:

EVALUATOR CUE: **Repeat any direction given to you with regards to EP-MA-114-100-F-01.**

EP-AA-112-100-F-01, Section 1.4.G

Performance Step: 8 Direct performance of State/Local notifications within 15 minutes of the event classification as required per the Notifications procedure.

Notification Procedure (EP-MA-114-100): Tab 3

Notification Form (EP-MA-114-100-F-01): Tab 4

Release in Progress Determination Guidance (EP-AA-114-F-01): Tab 21

√ **Standard:** Examinee fills out EP-MA-114-100-F-01 (while using EP-MA-114-100 and EP-AA-114-F-01 for guidance) as follows:

- Utility Message No. **1**
- Verified With: **N/A**
- Emergency Director Approval: **signature**
- 1 Call Status is **X This is a DRILL.**
- √ 3a Emergency Classification: **X General Emergency**
- 3b Affected Unit(s) is/are: **X One**
- 3c Declared at: **declaration time and date**
- 3d This represents a/an: **Initial Declaration**
- √ 4a Emergency Action level (EAL) No. is: **FG-1**
- √ 4b A Brief Non-Technical Description of the Event is as follows: **FG-1 sticker placed in the space provided**
- √ 5 Non-Routine Radiological Release Status is: **X b. Airborne radiological release in-progress.**
- √ 6a Wind Direction is from **120** (degrees)
- √ 6b Wind Speed is **6** (miles per hour)
- √ 7b **X Evacuate** 360 degress from 0 miles to **5** miles…
- 8 Conclusion: **X This is a DRILL**

Examinee hands the filled out form to the communicator.

Comment:

EVALUATOR NOTE: **The #2 Time Critical Stop Time is when the completed form, EP-MA-114-100-F-01, is handed to the Communicator.**

#2 Time Critical Stop Time: ________

EVALUATOR NOTE: **Time Critical #2 must be equal to or less than 15 minutes.**

Time Critical #2=	**(Time of declaration**	_______
	(#2 Critical Stop Time)	- _______
		= _______ **mins**

Terminating Cue: **When the candidate hands the completed Emergency Notification Form to the Communicator: Evaluation on this JPM is complete.**

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 NRC JPM SRO A4

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Initial Conditions:

- T= 0700:
  - Plant is at 100% Power.
  - Weather: Rain. Temp: 60°F. Wind: from 120° at 6 mph.
- T= 0701:
  - OBE Earthquake Alarm PRF-1-3 actuates.
  - A 11 gpm tube leak occurs in the “A” OTSG.
  - A 7 gpm tube leak occurs in the “B” OTSG.
- T= 0703:
  - An aftershock occurs.
  - Turbine Trip with an ATWS, Manual Reactor Trip was **NOT** successful due to multiple stuck rods.
  - An RCS leak occurs at the suction of RC-P-1C of 300gpm.
  - 4 psig ES actuation occurs.
  - MS-V-4A (ADV) sticks open and the MS-V-15A (MS-V-4A isolation) handwheel breaks off while still open.
- T= 0705 (**current time**):
  - Another aftershock causes the RCS leak to rise to 500gpm.
  - Containment Radiation levels on RM-A-22/23 indicate 2000 R/hr in Containment.

Initiating Cue: You are the Shift Manager. I will act as your communicator. Declare the appropriate EAL and respond in accordance with the EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST.

Time Critical: Yes

Facility:	THREE MILE ISLAND	Task No.:	21101002
Task Title:	Feed from the "C" RCBT and the BAMT	JPM No.:	2014 ILT NRC JPM A
K/A Reference:	001 A4.02 4.1/3.9	New for 2014 ILT NRC Exam	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor is at 100% power.
- A borated water addition is required to be made.
- CA-P-1A is OOS for repairs.
- BAMT level is currently 69 inches.
- High Feed Flow rates are not desired.
- Level tracking is desired.
- You are the Third RO.
- The instructor/examiner will act as the URO, ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- ARO will be responsible for all alarms.

Task Standard: Calculate the correct BAMT level change, final level, injection time, and RCBT feed rate, then feed from the "C" RCBT and the BAMT.

Required Materials: OP-TM-211-458, Feed From One RCBT and the BAMT, Rev 0, filled out through Step 4.2.2.

OP-TM-211-455, Feed From RCBT, Rev 1, filled out through Step 3.3.

Calculator

General References: OP-TM-211-458, Feed From One RCBT and the BAMT, Rev 0.
OP-TM-211-455, Feed From RCBT, Rev 1.

Initiating Cue: The Control Room Supervisor directs you to Feed from the BAMT and "C" RCBT IAW OP-TM-211-458, Feed From One RCBT and the BAMT.

Time Critical Task: N/A

Validation Time: 20 minutes

SIMULATOR SETUP

Exam Setup: IC 16, (Temp IC 121)

- Place an OOS tag on CA-P-1A
- Insert the following:
- MUR35 at 33 inches
- WDR15 at 69 inches
- Ensure the Pump "B" stroke counter is set at all "9"s.
- Ensure OP-TM-211-458 is filled out through step 4.2.2.
    - Step 4.2.1 will have 1102-4 as the procedure used.
    - Step 4.2.2 will have:
        - A target rod index of 88%
        - "C" RCBT as the feed source
        - 100 gallons required from the RCBT
        - 150 gallons required from the BAMT
- Ensure OP-TM-211-455 is filled out through step 3.3.3
- Ensure the Batch Controller top window is set for Total Flow and the bottom window is set for Flow Rate and the Batch Controller is Reset.
- This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide a copy of OP-TM-211-458, Feed From One RCBT and the BAMT, Rev 0, filled out through Step 4.2.2**

OP-TM-211-458 Step 4.2.3

Performance Step: 1 GO TO Step 4.4

Standard: Examinee reviews procedure through step 4.2.2 and then goes to Step 4.4

Comment:

OP-TM-211-458 Step 4.4.1

√ **Performance Step: 2** If injection volume tracking using BAMT level is desired, then calculate final BAMT level as follows: ___

1. CALCULATE BAMT level change by dividing Required BAMT Addition Volume by 48.35 gal/inch:
   ____________ gal / 48.35 gal/in = ____________ in
   Required BAMT Addition Volume — BAMT Δ Level

Standard: Examinee:

1. Obtains Required BAMT Additional volume from Step 4.2.2 (150 gallons) and writes it on the appropriate line in Step 4.4.1.
2. Divides 150 by 48.35 and comes up with 3.1.
3. Writes 3.1 on the appropriate line in Step 4.4.1.

Comment:

OP-TM-211-458 Step 4.4.2

√ **Performance Step: 3**

CALCULATE final BAMT level by subtracting BAMT level change from current BAMT level:

______________in - ____________in = _____________in

Current BAMT Level (PPC Pt A0475) | BAMT Δ Level | Final BAMT Level

Standard:

Examinee:

1. Obtains current BAMT level from PPC Point A0475 (69 inches) and writes it on the appropriate line in Step 4.4.2.
2. Obtains BAMT Δ Level from Step 4.4.1 (3.1 inches) and writes it on the appropriate line in Step 4.4.2.
3. Subtracts 3.1 inches from 69 inches and writes 65.9 on the appropriate line in Step 4.4.2.

Comment:

OP-TM-211-458 Step 4.5

√ **Performance Step: 4**

CALCULATE Boric Acid Injection Time by dividing Required BAMT Addition Volume by 10 gpm:

______________ gal / 10 gal/min = ____________min

BAMT Batch Size | Boric Acid Injection Time

Standard:

Examinee:

1. Obtains BAMT Batch Size from Step 4.2.2 (150 gallons) and writes it on the appropriate line in Step 4.5.
2. Divides 150 by 10, comes up with 15, and writes it on the appropriate line in Step 4.5

Comment:

OP-TM-211-458 Step 4.6

√ **Performance Step: 5**

CALCULATE Maximum RCBT Feed Rate by dividing Required RCBT Addition Volume by Boric Acid Injection Time:

____________gal /	____________min =	____________gal/min
Required RCBT Addition Volume	Boric Acid Injection Time	Maximum RCBT Feed Rate

Standard:

Examinee:

1. Obtains Required RCBT Additional Volume from Step 4.2.2 (100 gallons) and writes it on the appropriate line in Step 4.6.
2. Obtains Boric Acid Injection Time from Step 4.5 (15) and writes it on the appropriate line in Step 4.6.
3. Divides 100 by 15, comes up with 6.67, and writes it on the appropriate line in Step 4.5

Comment:

Examiner Note: **Step 4.7 is N/A**

OP-TM-211-458 Step 4.8

Performance Step: 6

If CA-P-1B will be used, then perform the following:
1. VERIFY the BORIC ACID PUMP B CONTROL LOCATION SELECT switch is in the LWDS position. ___
2. VERIFY CA-P-1B Pump Stroke Counter is set at "999999."

Standard:

Examinee verifies that the BORIC ACID PUMP B CONTROL LOCATION SELECT switch is in the LWDS position and that the CA-P-1B Pump Stroke Counter is set at 999999 (LWDS Panel).

Comment:

Examiner Cue: **When OP-TM-211-455 is located, hand the examinee a printed copy.**

Performance Step: 7

OP-TM-211-458 Step 4.9

Perform the following to initiate feed from the RCBT:
1. INITIATE OP-TM-211-455, "Feed from RCBT," using Required RCBT Addition Volume determined in this procedure as Required Addition Volume.
2. ENTER "N/A" in the following steps of OP-TM-211-455, "Feed from RCBT."
– Steps 4.1 through 4.4
– Steps 4.27 through 4.29

Standard: Examinee locates OP-TM-211-455 and enters N/A for steps 4.1-4.4 and 4.27-4.29.

Comment:

Performance Step: 8

OP-TM-211-455 Step 3.0

PRECAUTIONS, LIMITATIONS, AND PREREQUISITES.

Standard: Examinee reviews Precautions, Limitations, and Prerequisites.

Comment:

Procedure Note: **Raising RCS boron concentration without a defined target may be appropriate during emergent conditions or when the effect on RCS boron concentration is insignificant.**

Examiner Note: **Steps 4.5-4.8 are N/A.**

√ **Performance Step: 9**

OP-TM-211-455 Step 4.9
If feeding from "C" RCBT, then perform the following:
1. If WDL-P-6C is available, then perform the following:
   A. POSITION Feed Tank select switch to T1C.
   B. POSITION Waste Transfer Pump select switch to P6C.
   C. GO TO Step 4.10.

Standard:

Examinee determines that WDL-P-6C is available, and:
1. Places the Feed Tank select switch to the T1C position by rotating the switch in either direction until T1C is selected (LWDS Panel).
2. Places the Waste Transfer Pump select switch to P6C position by rotating the switch in either direction until P6C is selected (LWDS Panel).
3. Goes to Step 4.10

Comment:

Examiner Note: **Step 4.10 is N/A**

Examiner Note: **Procedure Note: The batch size may be raised to allow manually securing transfer at the required size. This is accomplished by entering an amount at least 11 gallons greater than the Required Addition Volume.**

√ **Performance Step: 10**

OP-TM-211-455 Step 4.11
Perform the following to enter desired quantity into the Batch Controller (MU12FZS/C/I) (CC):
1. PRESS BATCH SET.
2. ENTER desired batch volume.
3. PRESS ENTER.

Standard:

Examinee:
1. Presses BATCH SET on the Batch Controller (CC).
2. Enters between 100-120 as the desired batch volume on the Batch Controller (CC).
3. Presses ENTER on the Batch Controller (CC).

Comment:

Procedure Note: **Approximate VALVE SET positions vs. flow:**
- **10% ≈ 10 gpm**
- **20% ≈ 50 gpm**
- **21% ≈ 53 gpm ≈ letdown flow @ 2155 psig**

Examiner Note: **The Valve Set amount is not required to be precise at this time due to the fact that it will be adjusted correctly in OP-TM-211-458, Step 4.11.**

OP-TM-211-455 Step 4.12

Performance Step: 11 Perform the following to enter desired valve position into the Batch Controller (MU12FZS/C/I):
1. PRESS VALVE SET.
2. ENTER desired percent valve setting.
3. PRESS ENTER.

Standard: Examinee:
1. Presses VALVE SET on the Batch Controller (CC).
2. Enters approximately 6 as the desired percent valve setting on the Batch Controller (CC).
3. Presses ENTER on the Batch Controller (CC).

Comment:

Examiner Note: **Step 4.13 is a decision to be made by the examinee by preference.**

OP-TM-211-455 Step 4.13

Performance Step: 12 SELECT desired displays for the upper and lower windows of the Batch Controller (MU12FZS/C/I):
- Batch size (4)
- Inventory total (5)
- Running total (7)
- Flow rate (8)
- Valve demand (CE)

Standard: Examinee selects a display for the upper and lower windows of the Batch controller from the selected choices in Step 4.13, as desired (CC).

Comment:

OP-TM-211-455 Step 4.14

√ **Performance Step: 13** PRESS RUN on the Batch Controller (MU12FZS/C/I).

Standard: Examinee presses RUN on the Batch Controller (CC)

Comment:

OP-TM-211-455 Step 4.15

√ **Performance Step: 14** OPEN MU-V-10.

Standard: Examinee opens MU-V-10 and verifies Open by red open light lit, green closed light not lit (CC).

Comment:

OP-TM-211-455 Step 4.16

√ **Performance Step: 15** START the Waste Transfer Pump selected on the Waste Transfer Pump select switch.

Standard: Examinee starts the "C" Waste Transfer Pump by rotating the control switch in the clockwise direction and releasing, observing red running light lit and green secured light not lit (LWDS panel).

Comment:

OP-TM-211-455 Step 4.17

Performance Step: 16 If Batch Controller is operable, then VERIFY flow is indicated on Batch Controller.

Standard: Examinee verifies that flow is indicated on the Batch Controller by observing gallons per minute indicated (CC).

Comment:

Examiner Note: **Once flow is indicated on the Batch Controller, the examinee will return to OP-TM-211-458. Step 4.10 allows the examinee to continue.**

OP-TM-211-458 Step 4.11

√ **Performance Step: 17** SET RCBT feed flow rate to less than the "Maximum RCBT Feed Rate" IAW OP-TM-211-455, "Feed from RCBT."

Standard: If necessary, the Examinee adjusts RCBT feed rate IAW OP-TM-211-455, Step 4.19 as follows:

1. Presses Valve Set on the Batch Controller (CC).
2. Presses the "Λ" or "V" carrot button, as required, to establish RCBT feed flow rate to less than 6.67 gpm (the value established in OP-TM-211-458, Step 4.6) (CC).

Comment:

OP-TM-211-458 Step 4.12

√ **Performance Step: 18** OPEN MU-V-51.

Standard: Examinee opens MU-V-51 by pressing the red open pushbutton and verifying that the valve is open by the red light being lit and the green light not being lit (CC).

Comment:

OP-TM-211-458 Step 4.13

√ **Performance Step: 19** START one of the following Boric Acid Pumps:

– CA-P-1A
– CA-P-1B

Standard: Examinee starts CA-P-1B by rotating the control switch in the clockwise direction and releasing, observing red running light lit and green secured light not lit (LWDS panel).

Comment:

Terminating Cue: **After CA-P-1B is running, evaluation on this JPM may be terminated.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 ILT NRC JPM A

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- The Reactor is at 100% power.
- A borated water addition is required to be made.
- CA-P-1A is OOS for repairs.
- BAMT level is currently 69 inches.
- High Feed Flow rates are not desired.
- Level tracking is desired.
- You are the Third RO.
- The instructor/examiner will act as the URO, ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- ARO will be responsible for all alarms.

INITIATING CUE: The Control Room Supervisor directs you to Feed from the BAMT and "C" RCBT IAW OP-TM-211-458, Feed From One RCBT and the BAMT.

TIME CRITICAL: No

Facility: THREE MILE ISLAND   Task No.: 64101001

Task Title: Manually Initiate ESAS –Alt path   JPM No.: 2014 ILT NRC JPM B

K/A Reference: 006 A2.12   4.5/4.8   Bank TQ-TM-104-642-J007

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______   Actual Performance: X

Classroom ______   Simulator X   Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor has just been tripped.
- A small Break LOCA has occurred.
- Guide 9 has been implemented through step C.7.
- You are the URO.
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

Task Standard: Manually initiate Emergency Injection.

Required Materials:

- OP-TM-EOP-010, Guide 9, RCS Inventory Control, signed through step C.8, Rev 16.
- OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI), Rev 7.

General References:

- OP-TM-EOP-010, Guide 9, RCS Inventory Control, Rev 16.
- OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI), Rev 7.

Initiating Cue: The Control Room Supervisor directs you to INITIATE HPI IAW OP-TM-211-901, "Emergency Injection HPI/LPI".

Time Critical Task: N/A

Validation Time: 20 minutes

SIMULATOR SETUP

Exam Setup: IC 16, (Temp IC 122)

Trip the reactor

- Insert the following:

A. Malfunction ES01A **Immediately**

B. Malfunction ES01B **Immediately**

C. Malfunction ES02A **Immediately**

D. Malfunction ES02B **Immediately**

E. Malfunction ES04A **Immediately**

F. Malfunction ES04B **Immediately**

G. Malfunction TH06 to 0.03 **Immediately**

H. WAAT Pressurizer level is > 100", then modify TH06 to 0.02

I. Override 02A4S66-ZDIPB1RCA to OFF **Immediately**

J. Override 02A4S67-ZDIPB1RBA to OFF **Immediately**

K. Override 03A4S01-ZDIPB1RCB to OFF **Immediately**

L. Override 03A4S02-ZDIPB1RBB to OFF **Immediately**

M. Ensure MUMMT=27000.0

3. Perform Guide 9 through step C.7
   a. Ensure MU-V-217 is OPEN
   b. Ensure MU-V-3 is CLOSED
4. Freeze the Simulator.
5. When the above steps are completed for this and other JPMs to be run concurrently then validate, if not previously validated, the concurrently run JPMs using the JPM Validation Checklist.
6. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide a copy of OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI).**

Performance Step: 1 PRECAUTIONS, LIMITATIONS, AND PREREQUISITES.

Standard: Examinee reviews Precautions, Limitations, and Prerequisites.

Comment:

Procedure Note: **There are special usage requirements for Section 4.1 and Attachments 7.1, 7.2 and 7.3. These actions are memory items (IAW OS 24) and performed from memory when required. The sequence of actuation and verification of ES is not train dependent. Either train may be performed first or trains may be performed in parallel.**

Examiner Note: **Step 4.1.1 is N/A.**

OP-TM-211-901 Step 4.1.2

Performance Step: 2 If ESAS Train A "Load Seq Block 4" lights (PCR) are not BLUE, then PRESS "Manual ES Actuation" "1600 PSIG RC PRESS" (Train A CC).

Standard: Examinee verifies ESAS Train A "Load Seq Block 4" lights (PCR) are NOT blue, and presses "Manual ES Actuation" "1600 PSIG RC PRESS" (Train A CC).

Comment:

Procedure Note: **PCR graphic display is equivalent to Attachment 7.1**

Examiner Note: **Examinee may attempt to initiate "B" Train ES prior to going to Section 4.2. This is allowed IAW OS-24.**

OP-TM-211-901 Step 4.1.3

Performance Step: 3 If any of the components on Attachment 7.1 are not in the required condition, then INITIATE Section 4.2

Standard: Examinee recognizes that components are NOT in the required condition and initiates Section 4.2.

Comment:

Examiner Note: **Step 4.1.4 is N/A.**

OP-TM-211-901 Step 4.1.5

Performance Step: 4 If ESAS Train B "Load Seq Block 4" lights (PCR) are not BLUE, then PRESS "Manual ES Actuation" "1600 PSIG RC PRESS" (Train B CR).

Standard: Examinee recognizes ESAS Train B "Load Seq Block 4" lights (PCR) are NOT blue and presses "Manual ES Actuation" "1600 PSIG RC PRESS" (Train B CR).

Comment:

Procedure Note: **PCR graphic display is equivalent to Attachment 7.2**

OP-TM-211-901 Step 4.1.6

Performance Step: 5 If any of the components on Attachment 7.2 are not in the required condition, then INITIATE Section 4.2

Standard: Examinee recognizes that components are NOT in the required condition and initiates Section 4.2.

Comment:

Alternate Path Begins

Performance Step: 6

OP-TM-211-901 Step 4.2.1.1
If MU-V-14A or MU-V-14B did not Open, then perform the following:
1. IAAT MU tank level < 18", then perform the following:
   A. PLACE all of the following in Pull-to-lock.
      ___ MU-P-1A
      ___ MU-P-1B
      ___ MU-P-1C

Standard: Examinee recognizes MU tank level is NOT <18" and continues on.

Comment:

Examiner Note: **Step 4.2.1.2 is N/A.**

Examiner Note: **The student may choose to open both MU-V-14A and MU-V-14B. This is allowed per OS-24 (manually performing an action due to the automatic action failing), and also applies at other points during this JPM.**

√ **Performance Step: 7**

OP-TM-211-901 Step 4.2.1.3
If MU-V-14A or MU-V-14B did not Open, then perform the following:
- ENSURE MU-V-14A or MU-V-14B is Open.

Standard: Examinee opens MU-V-14A and/or MU-V-14B by pressing the open pushbutton, observing the Open light is lit and the closed light is not lit (CC).

Comment:

√ **Performance Step: 8**

OP-TM-211-901 Step 4.2.2.1
IAAT DC-P-1A or DC-P-1B fails to start or is shut down unexpectedly, then perform the following:
1. If DC-P-1A fails to start, then START DC-P-1A

Standard: Examinee starts DC-P-1A by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CC).

Comment:

Examiner Note: **Step 4.2.2.2 is N/A.**

√ **Performance Step: 9**

OP-TM-211-901 Step 4.2.2.3
IAAT DC-P-1A or DC-P-1B fails to start or is shut down unexpectedly, then perform the following:
3. If DC-P-1B fails to start, then START DC-P-1B

Standard: Examinee starts DC-P-1B by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CR).

Comment:

Performance Step: 10

OP-TM-211-901 Step 4.2.2.4
IAAT DC-P-1A or DC-P-1B fails to start or is shut down unexpectedly, then perform the following:
4. If DC-P-1B is not operating then perform the following:
   A. PLACE MU-P-1C in PTL.
   B. PLACE DH-P-1B in PTL.
   C. PLACE BS-P-1B in PTL.
   D. INITIATE OP-TM-543-440 "Swapping MU-P-1C cooling to NS".

Standard: Examinee recognizes that DC-P-1B is running and continues on.

Comment:

Performance Step: 11

OP-TM-211-901 Step 4.2.3.1.A

IAAT either ES selected MU pump fails to start or is shut down unexpectedly, then perform the following:

1. If Train A ES selected MU pump is not operating, then perform the following:

    A. VERIFY 1D 4160V bus is energized.

Standard: Examinee recognizes that MU-P-1A is not operating and verifies that 1D 4160V bus is energized.

Comment:

Examiner Note: **Step 4.2.3.1.B is N/A.**

Booth Operator Cue: **If contacted as an NLO, state that MU-P-3A is operating.**

Performance Step: 12

OP-TM-211-901 Step 4.2.3.1.C.1)

IAAT either ES selected MU pump fails to start or is shut down unexpectedly, then perform the following:

1. If Train A ES selected MU pump is not operating, then perform the following:

    C. If MU-P-1A is ES Selected, then perform the following:

        1) VERIFY MU-P-2A or MU-P-3A is operating

Standard: Examinee verifies MU-P-2A or MU-P-3A is operating by one or more of the following:

- "RC Makeup Pump A Oil Pumps" light is lit
- MAP D-1-1 is clear
- Contacting an NLO

Comment:

	OP-TM-211-901 Step 4.2.3.1.C.2)
√ **Performance Step: 13**	IAAT either ES selected MU pump fails to start or is shut down unexpectedly, then perform the following: 1. If Train A ES selected MU pump is not operating, then perform the following: C. If MU-P-1A is ES Selected, then perform the following: 2) START MU-P-1A
Standard:	Examinee starts MU-P-1A by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CC).
Comment:	
Examiner Note:	**Steps 4.2.3.1.C.3) and 4.2.3.1.D are N/A.**
	OP-TM-211-901 Step 4.2.3.2.A
Performance Step: 14	IAAT either ES selected MU pump fails to start or is shut down unexpectedly, then perform the following: 2. If Train B ES selected MU pump is not operating, then perform the following: A. VERIFY 1E 4160V bus is energized.
Standard:	Examinee recognizes that MU-P-1C is not operating and verifies that 1E 4160V bus is energized.
Comment:	
Examiner Note:	**Step 4.2.3.2.B is N/A.**
Booth Operator Cue:	**If contacted as an NLO, state that MU-P-3C is operating.**

OP-TM-211-901 Step 4.2.3.2.C.1)

Performance Step: 15 IAAT either ES selected MU pump fails to start or is shut down unexpectedly, then perform the following:
2. If Train B ES selected MU pump is not operating, then perform the following:
C. If MU-P-1C is ES Selected, then perform the following:
1) VERIFY MU-P-2C or MU-P-3C is operating

Standard: Examinee verifies MU-P-2C or MU-P-3C is operating by one or more of the following:
- "RC Makeup Pump C Oil Pumps" light is lit
- MAP D-1-3 is clear
- Contacting an NLO

Comment:

OP-TM-211-901 Step 4.2.3.2.C.2)

√ **Performance Step: 16** IAAT either ES selected MU pump fails to start or is shut down unexpectedly, then perform the following:
2. If Train B ES selected MU pump is not operating, then perform the following:
C. If MU-P-1C is ES Selected, then perform the following:
2) START MU-P-1C

Standard: Examinee starts MU-P-1C by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CR).

Comment:

Examiner Note: **Steps 4.2.3.2.C.3), 4.2.3.2.D, and 4.2.3.3 are N/A.**

√ **Performance Step: 17**

OP-TM-211-901 Step 4.2.4.1
If any of the following did not Open
___ MU-V-16A
___ MU-V-16B
___ MU-V-16C
___ MU-V-16D
then perform the following to ensure flow through all four HPI nozzles:
1. If two ES selected MU pumps are operating, then ENSURE one of the following pairs of valves are Open: (N/A steps not performed)
A. MU-V-16A and MU-V-16B
B. MU-V-16A and MU-V-16D
C. MU-V-16B and MU-V-16C
D. MU-V-16C and MU-V-16D

Standard: Examinee recognizes that MU-V-16A-D are closed and opens, at a minimum, a pair of MU-V-16's, verified by Open lights being lit and Closed lights not lit (CC/CR).

Comment:

Examiner Note: **Steps *4.2.4.2, 4.2.4.3*, and 4.2.4.4 are N/A.**

Examiner Note: **The combination of MU-V-16 valves opened in the previous step will determine whether valve manipulation takes place in the next two steps.**

Performance Step: 18

OP-TM-211-901 Step 4.2.5.1
If MU-V-36 and MU-V-37 did not Close, then perform the following:
1. If MU-P-1A or MU-P-1B-D is operating, then ENSURE MU-V-16A or MU-V-16B is Open

Standard: Examinee recognizes that MU-V-36 and MU-V-37 are open and ensures MU-V-16A or MU-V-16B is open, verified by Open light being lit and Closed light not lit.

Comment:

Performance Step: 19

OP-TM-211-901 Step 4.2.5.2
If MU-V-36 and MU-V-37 did not Close, then perform the following:
2. If MU-P-1C or MU-P-1B-E is operating, then ENSURE MU-V-16C or MU-V-16D is Open

Standard:

Examinee recognizes that MU-V-36 and MU-V-37 are open and ensures MU-V-16C or MU-V-16D is open, verified by Open light being lit and Closed light not lit.

Comment:

√ **Performance Step: 20**

OP-TM-211-901 Step 4.2.5.3
If MU-V-36 and MU-V-37 did not Close, then perform the following:
3. ENSURE MU-V-36 or MU-V-37 is Closed.

Standard:

Examinee closes MU-V-36 and/or MU-V-37 by pressing the closed pushbutton and verifying that the closed light is lit and the open light is not lit (CC).

Comment:

√ **Performance Step: 21**

OP-TM-211-901 Step 4.2.6
If MU-V-18 did not Close, then perform one of the following: (N/A step not performed)
1. ENSURE MU-V-18 is Closed.
2. ENSURE MU-V-17 and MU-V-217 are Closed

Standard:

Examinee closes MU-V-18 by pressing the close pushbutton and verifying that the closed light is lit and the open light is not lit (CC). The examinee may close MU-V-17 and MU-V-217 (CC).

Comment:

√ **Performance Step: 22**

OP-TM-211-901 Step 4.2.7.1
IAAT DH-P-1A or DH-P-1B fails to start or is shut down unexpectedly (e.g., cavitation), then perform the following:
1. If DH-P-1A failed to start, then perform the following:
    A. VERIFY DC-P-1A is operating.
    B. START DH-P-1A

Standard:

Examinee recognizes that DH-P-1A failed to start, verifies DC-P-1A is operating by the running light and normal running amps, and starts DH-P-1A by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CC).

Comment:

√ **Performance Step: 23**

OP-TM-211-901 Step 4.2.7.2
IAAT DH-P-1A or DH-P-1B fails to start or is shut down unexpectedly (e.g., cavitation), then perform the following:
2. If DH-P-1B failed to start, then perform the following:
    A. VERIFY DC-P-1B is operating.
    B. START DH-P-1B

Standard:

Examinee recognizes that DH-P-1B failed to start, verifies DC-P-1B is operating by the running light and normal running amps, and starts DH-P-1B by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CR).

Comment:

Examiner Note: **Steps 4.2.7.3, 4.2.8.1.A(/B/C), and 4.2.8.2.A(/B/C) are N/A.**

OP-TM-211-901 Step 4.2.9

√ **Performance Step: 24**
If DH-V-4A or DH-V-4B is not Open, then perform the following:
1. VERIFY DH-P-1A and DH-P-1B are operating
2. ENSURE both DH-V-4A and DH-V-4B are Open.

Standard:
Examinee recognizes that DH-V-4A and DH-V-4B are closed, verifies that DH-P-1A and DH-P-1B are operating by the running indicator lights and the normal running amps, and opens both DH-V-4A and DH-V-4B by pressing the open pushbuttons and verifying that the open lights are lit and the closed lights are not lit (CC/CR).

Comment:

OP-TM-211-901 Step 4.2.10

√ **Performance Step: 25**
If DR-P-1A is not operating or DR-V-1A is Closed, then perform the following:
1. START DR-P-1A
2. ENSURE DR-V-1A is Open

Standard:
Examinee recognizes that DR-P-1A is not operating and/or that DR-V-1A is closed and starts DR-P-1A by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CC). Examinee verifies DR-V-1A is open by verifying that the open light is lit and the closed light is not lit (CC).

Comment:

Examiner Note: **Step 4.2.10.3 is N/A.**

√ **Performance Step: 26**

OP-TM-211-901 Step 4.2.11
If DR-P-1B is not operating or DR-V-1B is Closed, then perform the following:
1. START DR-P-1B
2. ENSURE DR-V-1B is Open

Standard: Examinee recognizes that DR-P-1B is not operating and/or that DR-V-1A is closed and starts DR-P-1B by rotating the control switch in the clockwise direction, observing running light is lit and normal running amps (CR). Examinee verifies DR-V-1B is open by verifying that the open light is lit and the closed light is not lit (CR).

Comment:

Examiner Note: **The JPM may be terminated at this point. The following step is scripted as an action that may take place while DR-V-1B is travelling open.**

Examiner Note: **Steps 4.2.11.3 and 4.2.12 are N/A.**

Performance Step: 27

OP-TM-211-901 Step 4.2.13
If NR-V-4A or NR-V-4B is not closed, then perform the following:
A. ENSURE NR-V-4A or NR-V-4B is Closed (PL).

Standard: Examinee recognizes that NR-V-4A and NR-V-4B are open and closes NR-V-4A or NR-V-4B by pressing the close pushbutton and verifying green closed light lit, red open light not lit (PL).

Comment:

Examiner Note: **Steps 4.2.13.B and 4.2.14 are N/A.**

Terminating Cue: **After DR-V-1B is open, evaluation on this JPM is complete.**

STOP TIME: ______________ **TIME CRITICAL STOP TIME:** N/A

Job Performance Measure No.: 2014 ILT NRC JPM B

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- The Reactor has just been tripped.
- A small Break LOCA has occurred.
- Guide 9 has been implemented through step C.7.
- You are the URO.
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

INITIATING CUE: The Control Room Supervisor directs you to INITIATE HPI IAW OP-TM-211-901, "Emergency Injection HPI/LPI".

TIME CRITICAL: No

Facility:	THREE MILE ISLAND	Task No.:	AOP211005
Task Title:	Restore Seal Injection with a Loss of ICCW – Alternate Path	JPM No.:	2014 ILT NRC JPM C
K/A Reference:	003 K6.02 2.7/3.1	New for 2014 ILT NRC Exam	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor is at 100% power.
- MU-P-1B has tripped and is not selected for ES from either power supply.
- You are the URO.
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

Task Standard: Attempt to restore Seal Injection and trip the Reactor and Reactor Coolant Pumps when required.

Required Materials:

- OP-TM-AOP-041, Loss Of Seal Injection, Rev 6.

General References:

- OP-TM-AOP-041, Loss Of Seal Injection, Rev 6.
- OP-TM-EOP-001, Reactor Trip, Rev 12.

Initiating Cue: The Control Room Supervisor directs you to restore Seal Injection IAW OP-TM-AOP-041, Loss of Seal Injection.

Time Critical Task: N/A

Validation Time: 20 minutes

SIMULATOR SETUP

Exam Setup: IC 16, (Temp IC 123)

1. Insert the following:

   A. Remote MUR12 on Event #1 to open MU-V-76A&B

   B. Trigger #2 MU-P-1C>1.0

      IMF CC04A 10

   C. Override 03A4S22-ZDIICP1B(4) to ON Immediately

   D. Override 03A4S22-ZDIICP1B(1) to OFF Immediately

   E. Override 03A4S22-ZDIICP1B(2) to OFF Immediately

   F. Override 03A4S22-ZDIICP1B(3) to OFF Immediately

   G. Override 03A4S22-ZDIICP1B(5) to OFF Immediately

   H. Override 02A5S71-ZDICSMUP1A(1) to ON Immediately

   I. Override 02A5S71-ZDICSMUP1A(2) to OFF Immediately

   J. Override 02A5S71-ZDICSMUP1A(3) to OFF Immediately

   K. Override 02A5S71-ZDICSMUP1A(4) to OFF Immediately

   L. Override 02A5S71-ZDICSMUP1A(5) to OFF Immediately

   M. Malfunction RC36 Immediately

   N. Malfunction MU33A Immediately

   O. Malfunction MU31C Immediately

3. Freeze the Simulator.

4. When the above steps are completed for this and other JPMs to be run concurrently then validate, if not previously validated, the concurrently run JPMs using the JPM Validation Checklist.

5. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide a copy of OP-TM-AOP-041, Loss Of Seal Injection.**

Evaluator's Note: **Steps 3.1 and 3.2 are "If At Any Time" steps and are not applicable at this time.**

OP-TM-AOP-041 Step 3.3

√ **Performance Step: 1** ENSURE MU-V-32 is in HAND and Closed.

Standard: Examinee recognizes that MU-V-32 is in AUTO and open, and:

1. Presses the white HAND button on the MU-V-32 Bailey controller station, observing that the white HAND light is lit and the red AUTO light is not lit (CC).
2. Holds the toggle switch on the MU-V-32 Bailey controller station in the downward direction until MU-V-32 indicates closed by the indicator being at 0 (CC).

Comment:

OP-TM-AOP-041 Step 3.4

Performance Step: 2 When 1D or 1E 4160V bus is energized, then CONTINUE.

Standard: Examinee verifies 1D and/or 1E 4160V bus is energized and continues.

Comment:

OP-TM-AOP-041 Step 3.5

Performance Step: 3 VERIFY a makeup pump is operating (MU header pressure MU2-PI is above RCS pressure) and aligned to seal injection.

Standard: Examinee determines that a makeup pump is not operating by none of the three makeup pumps showing red running lights or amps (CC/CR) and goes to the RNO column.

Comment:

OP-TM-AOP-041 Step 3.5, RNO 1

Performance Step: 4 ENSURE MU-V-3 is Closed.

Standard: Examinee closes MU-V-3 by pressing the green closed pushbutton and verifying that the red Open light is not lit and the green closed light is lit (CC).

Comment:

OP-TM-AOP-041 Step 3.5, RNO 2

Performance Step: 5 ENSURE MU-V-17 is Closed.

Standard: Examinee closes MU-V-17 by:

1. Presses the white HAND button on the MU-V-17 Bailey controller station, observing that the white HAND light is lit and the red AUTO light is not lit (CC).
2. Holds the toggle switch on the MU-V-17 Bailey controller station in the downward direction until MU-V-17 indicates closed by the indicator being at 0 (CC).

Comment:

OP-TM-AOP-041 Step 3.5, RNO 3

Performance Step: 6 VERIFY [MU tank level >40"] or [MU-V-14A or B is Open].

Standard: Examinee verifies that MU tank level is greater than 40" by observing the MU-T level indicator (CC)

Comment:

Examiner Note: **Step 3.5, RNO 4 is N/A.**

OP-TM-AOP-041 Step 3.5, RNO 5

Performance Step: 7 If MU-V-77 A & B are Open, then GO TO section 4.0.

Standard: Examinee recognizes that MU-V-77A&B are open by the plate indicator (CC) or by recognizing the initial conditions did not state anything to contradict normal lineups, and Goes To Section 4.0

Comment:

Examiner Note: **Step 4.0 is N/A.**

Booth Operator Note: **If contacted as an NLO, reply that MU-P-1A has been verified as ES selected.**

OP-TM-AOP-041 Step 4.1

Performance Step: 8 Ensure MU-P-1A is ES Selected. (CB 338: 1D 4160V Bus Unit 7)

Standard: Examinee recognizes MU-P-1A is ES Selected from the initial conditions.

Comment:

OP-TM-AOP-041 Step 4.2

Performance Step: 9 VERIFY one of the following:

- MU-V-36 and 37 are Open
- MU-V-16A or 16B is Open

Standard: Examinee verifies that MU-V-36 and MU-V-37 are open by the red open lights lit, green closed lights not lit (CC)

Comment:

OP-TM-AOP-041 Step 4.3

Performance Step: 10 ENSURE DR-P-1A and DC-P-1A are operating.

Standard: Examinee:

1. Starts DR-P-1A by rotating the Control switch clockwise to the Start position, releasing to the Normal-After-Start position, and verifying red running light lit, green stop light not lit, and amps (CC).
2. Starts DC-P-1A by rotating the Control switch clockwise to the Start position, releasing to the Normal-After-Start position, and verifying red running light lit, green stop light not lit, and amps (CC).

Comment:

OP-TM-AOP-041 Step 4.4

Performance Step: 11 START MU-P-1A.

Standard: Examinee attempts to start MU-P-1A by rotating the Control switch clockwise to the Start position, releasing to the Normal-After-Start position, recognizes that MU-P-1A fails to start by red running light not lit, green stop and yellow mismatch lights lit, and no amps (CC).
Examinee Goes to RNO column.

Comment:

Examiner Note: **Step 4.4, RNO 1 is N/A.**

OP-TM-AOP-041 Step 4.4, RNO 2

Performance Step: 12 If MU-P-1C is available, then GO TO Section 6.0.

Standard: Examinee determines that MU-P-1C is available and Goes To Section 6.0.

Comment:

Booth Operator Cue: **If contacted as an NLO to open MU-V-76A&B, acknowledge the direction and insert EVENT #1 to open MU-V-76A&B.**

OP-TM-AOP-041 Step 6.0

Performance Step: 13 If MU-V-76A & B are closed and HPI train A and Normal MU header piping is intact, then DISPATCH an operator to open MU-V-76 A & B. (AB 281: MU valve alley)

Standard: Examinee determines that MU-V-76A&B are closed by the plate indicator (CC) or by recognizing the initial conditions did not state anything to contradict normal lineups, and dispatches an NLO to open MU-V-76A and MU-V76B.

Comment:

OP-TM-AOP-041 Step 6.1

Performance Step: 14 Ensure MU-P-1C is ES Selected. (CB 338: 1E 4160V Bus Unit 9)

Standard: Examinee recognizes MU-P-1C is ES Selected from the initial conditions.

Comment:

OP-TM-AOP-041 Step 6.2

Performance Step: 15 VERIFY one of the following:

˜ MU-V-36 and 37 are Open

˜ MU-V-16A or 16B is Open

Standard: Examinee verifies that MU-V-36 and MU-V-37 are open by the red open lights lit, green closed lights not lit (CC)

Comment:

√	**Performance Step: 16**	***OP-TM-AOP-041 Step 6.3*** ENSURE DR-P-1P and DC-P-1B are operating.
	Standard:	Examinee: 1. Starts DR-P-1B by rotating the Control switch clockwise to the Start position, releasing to the Normal-After-Start position, and verifying red running light lit, green stop light not lit, and amps (CR). 2. Starts DC-P-1B by rotating the Control switch clockwise to the Start position, releasing to the Normal-After-Start position, and verifying red running light lit, green stop light not lit, and amps (CR).
	Comment:	
√	**Performance Step: 17**	***OP-TM-AOP-041 Step 6.4*** START MU-P-1C.
	Standard:	Starts MU-P-1C by rotating the Control switch clockwise to the Start position, releasing to the Normal-After-Start position, and verifying red running light lit, green stop light not lit, and amps (CR).
	Comment:	

Alternate Path Begins

	Booth Operator Cue:	**Ensure Event #2 is triggered when MU-P-1C is started. If not, then Insert Event #2.**
	Performance Step: 18	***OP-TM-AOP-041 Step 3.1.A*** IAAT ICCW flow is < 550 GPM (IC-5 FI) and SI Flow < 22 GPM, then perform the following: A. ENSURE the reactor is tripped.
	Standard:	Examinee recognizes that ICCW flow is < 550 GPM (CR) and SI Flow < 22 GPM (CC) and performs the Immediate Manual Actions of OP-TM-EOP-001.
	Comment:	

OP-TM-EOP-001, Step 2.1

√ **Performance Step: 19** PRESS both Reactor Trip and DSS pushbuttons.

Standard: Examinee presses the Reactor Trip pushbutton (CC) and the DSS pushbutton (CC).

Comment:

OP-TM-EOP-001, Step 2.2

Performance Step: 20 VERIFY REACTOR SHUTDOWN.

Standard: Examinee verifies the reactor is shutdown as defined in OS-24, Conduct of Operations During Abnormal and Emergency Events:

> The reactor is shutdown when the heat generation by fission has been stopped. This condition can be confirmed immediately following a reactor trip as follows:
> 1) Power Range NI's indicate less than 5%,
> 2) all control rods are inserted, or
> 3) source range count rate is continuously lowering.

Comment:

OP-TM-EOP-001, Step 2.3

√ **Performance Step: 21** PRESS Turbine Trip pushbutton.

Standard: Examinee presses the Turbine Trip pushbutton (CL)

Comment:

OP-TM-EOP-001, Step 2.4

Performance Step: 22 VERIFY the turbine stop valves are Closed.

Standard: Examinee verifies the Turbine Stop Valves are closed by observing the digital indications on CL.

Comment:

Examiner Note: **The examinee may perform a symptom check at this time, but it is not required.**

OP-TM-AOP-041 Step 3.1.B

√ **Performance Step: 23** IAAT ICCW flow is < 550 GPM (IC-5 FI) and SI Flow < 22 GPM, then perform the following:

B. ENSURE all RCPs are tripped.

Standard:

Examinee secures RC-P-1A by rotating the Control Switch (CC) counter-clockwise to the “Stop” position and releasing it to the “Normal-After-Stop” position, verifying the green light is lit, red light is not lit, and amps indicate zero (CC).

Examinee secures RC-P-1B by rotating the Control Switch (CC) counter-clockwise to the “Stop” position and releasing it to the “Normal-After-Stop” position, verifying the green light is lit, red light is not lit, and amps indicate zero (CC).

Examinee secures RC-P-1C by rotating the Control Switch (CC) counter-clockwise to the “Stop” position and releasing it to the “Normal-After-Stop” position, verifying the green light is lit, red light is not lit, and amps indicate zero (CC).

Examinee secures RC-P-1D by rotating the Control Switch (CC) counter-clockwise to the “Stop” position and releasing it to the “Normal-After-Stop” position, verifying the green light is lit, red light is not lit, and amps indicate zero (CC).

Comment:

Terminating Cue: **After RCP’s are secured, evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 ILT NRC JPM C

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- The Reactor is at 100% power.
- MU-P-1B has tripped and is not selected for ES from either power supply.
- You are the URO.
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

INITIATING CUE: The Control Room Supervisor directs you to restore Seal Injection IAW OP-TM-AOP-041, Loss of Seal Injection.

TIME CRITICAL: No

Facility:	TMI Unit 1	Task No.:	40101004
Task Title:	Transfer Feedwater Pump From ICS to the Motor Speed Changer	JPM No.:	2014 ILT NRC JPM D
K/A Reference:	059 A2.11 (3.0 / 3.3)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor is operating at 100% power with ICS in full automatic.
- Maintenance is scheduled to be performed on the E/P converter for FW-P-1A.
- An Auxiliary Operator is standing by FW-P-1A speed control cabinet with a radio to support Operations.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

Task Standard: Transfer Feedwater Pump From ICS to the Motor Speed Changer.

Required Materials: None

General References: OP-TM-401-472, Manual Control of FW-P-1A, Rev. 3

Handouts: OP-TM-401-472, Manual Control of FW-P-1A, Rev. 3

Initiating Cue: Transfer speed control of FW-P-1A to its Motor Speed Changer in accordance with OP-TM-401-472.

Time Critical Task: No

Validation Time: 10 Minutes

SIMULATOR SETUP

1. Reset the simulator to IC 16 or similar 100% IC
2. When the above steps are completed for this and other JPMs to be run concurrently then validate, if not previously validated, the concurrently run JPMs using the JPM Validation Checklist.
3. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

OP-TM-401-472, Step 4.1

√ **Performance Step: 1**

If ICS HAND power is energized, then transfer the FW-P-1A to HAND as follows:

- PLACE FW-P-1A (FP A TURBINE SPEED CONTROL) station in HAND.
- ADJUST FW-P-1A speed demand to maintain limits.

Standard:

- Examinee verifies on PCL, ICS/NNI Power, Hand Power light is 'LIT".
- Examinee presses White Hand PB on FW-P-1A.White light is LIT.
- Examinee adjusts FW-P-1A with toggle switch as necessary.

Comment:

Procedure Caution

Ensure an operator is ready to adjust total FW flow as needed when FW pump speed is reduced. Fast Lower & Fast Raise positions on the governor control switch change FW pump Turbine speed rapidly.

OP-TM-401-472, Step 4.2.1

√ **Performance Step: 2**

If FW-P-1A speed control using MSC is required, then perform the following:

- PLACE 1A FPT Governor control to Slow Lower or Fast Lower and LOWER FW-P-1A speed (FW-SR-6/7 or PPC A0320) approximately 100 rpm.

Standard:

- Examinee rotates 1A FPT Governor control switch (CL) counter clockwise, until an approximate 100 rpm reduction in rpm is noted. 1A FPT Governor control switch is released.
- Examinee verifies 1A FPT White "LOW' light is illuminated.

Comment:

OP-TM-401-472, Step 4.2.2

√ **Performance Step: 3** PLACE FP A TURBINE Full Range Manual Speed control to ON.

Standard: FP A TURBINE Full Range Manual speed switch (CL) is rotated clockwise to 'ON'.

Comment:

OP-TM-401-472, Step 4.2.3

√ **Performance Step: 4** ADJUST turbine speed with 1A FPT Governor to maintain limits.

Standard: Turbine speed adjusted as necessary to maintain limits.(~35 psid and equal flows on both Feed pumps)

Comment:

Terminating Cue: **When candidate has demonstrated the ability to use the MSC to control feedwater flow, evaluation of this JPM is complete.**

STOP TIME: ____________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 ILT NRC JPM D

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- The Reactor is operating at 100% power with ICS in full automatic.
- Maintenance is scheduled to be performed on the E/P converter for FW-P-1A.
- An Auxiliary Operator is standing by FW-P-1A speed control cabinet with a radio to support Operations.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

INITIATING CUE: Transfer speed control of FW-P-1A to its Motor Speed Changer in accordance with OP-TM-401-472.

TIME CRITICAL No

Facility:	THREE MILE ISLAND	Task No.:	53401007
Task Title:	Perform Emergency Operations of Reactor Building Emergency Cooling Water – Alternate Path	JPM No.:	2014 NRC JPM E
K/A Reference:	022 A4.04 3.1 / 3.2		Modified from TQ-TM-104-534-J100

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Plant is at 100% power.
- ICS is in full AUTO.
- There is a small steam leak inside Containment.
- The Operations Director is informed of the situation.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

Task Standard: RB Emergency Cooling is initated with cooler pressure maintained 52-75 psig.

Required Materials: None

General References: OP-TM-534-901 RB Emergency Cooling Operations, Rev. 12

Handout: OP-TM-534-901 signed off through Section 3.3.

Initiating Cue: The Control Room Supervisor has directed you to initiate Reactor Building Emergency Cooling using OP-TM-534-901, RB Emergency Cooling Operations.

Time Critical Task: N/A

Validation Time: 15 minutes

SIMULATOR SETUP

- IC-17 (Temporarily snapped in IC-252)
- MALFUNCTIONS:
  - MS02A at 0.1% severity
  - MS02B at 0.1% severity
  - RW08 at 0% severity (to close RR-V-6)
  - 03A4S46-ZDIRRV4B(1) to OFF immediately
  - 03A4S39-ZDIRRV4B(2) to ON immediately
  - CCR32, NS-V-85 to close, on EVENT 1
  - Reduce power as necessary to maintain power less than 100%.
  - FREEZE the simulator.

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Once OP-TM-534-901 is located, provide JPM copy.**

Performance Step: 1 Locate OP-TM-534-901.

Standard: Locates procedure.

Comment:

Booth Operator Cue: **When directed as an NLO to close NS-V-85, acknowledge the order, insert EVENT #1, and then report back that NS-V-85 is closed.**

Evaluator's Note: **Examinee does not have to wait for NS-V-85 to be closed to continue in the procedure.**

OP-TM-534-901, Step 4.1.1

Performance Step: 2 DISPATCH an operator to CLOSE NS-V-85 (IB 295: S of RR valve room).

Standard: Contacts AO to close NS-V-85.

Comment:

Procedure Note: **The sequence of actuation and verification of ES is not train dependent. Either train may be performed first or trains may be performed in parallel.**

Performance Step: 3

OP-TM-534-901, Step 4.1.2
IAAT expected equipment response is not obtained when initiating the desired train(s) of RBEC, then INITIATE Section 4.2, Contingency Actions.

Standard: Examinee reads the statement and continues.

Comment:

√ **Performance Step: 4**

OP-TM-534-901, Step 4.1.3
START or VERIFY running:

- RR-P-1A
- RR-P-1B

Standard: Examinee starts RR-P-1A (CC) and RR-P-1B (CR) by rotating the Control Switch for each in the clockwise direction, observing the red “running” light is lit and the green “secured” light is not lit, and normal running amps indicated for each pump.

Comment:

√ **Performance Step: 5**

OP-TM-534-901, Step 4.1.4
ENSURE OPEN:

- RR-V-3A
- RR-V-3B
- RR-V-3C

Standard: Examinee opens RR-V-3A, RR-V-3B and RR-V-3C by pressing the respective OPEN pushbutton on CR.

Comment:

Alternate Path Begins

Evaluator's Note: **Once the examinee recognizes that RR-V-4B will not open, they may choose to immediately go to Section 4.2 or to continue with Section 4.1 prior to going to Section 4.2. Either method is acceptable. This JPM continues in Section 4.1. Section 4.2 begins on Performance Step 8.**

√ **Performance Step: 6**

OP-TM-534-901, Step 4.1.5

ENSURE OPEN:

- RR-V-4A
- RR-V-4B
- RR-V-4C
- RR-V-4D
- RR-V-1A
- RR-V-1B

Standard: Examinee opens RR-V-4A, RR-V-4C, RR-V-4D, RR-V-1A AND RR-V-1B by pressing the respective OPEN pushbutton on CC and CR and observing the red "open" light lit and green "closed" light not lit.
Examinee recognizes that RR-V-4B will not open by the green "closed" light lit and red "open" light not lit (CR).

Comment:

Performance Step: 7

OP-TM-534-901, Step 4.1.6

VERIFY the coolers in service are controlled at 50 – 75 psig:

- RR-PI-224
- RR-PI-225
- RR-PI-226

Standard: Examinee determines that all coolers are greater than 75 psig and goes to Section 4.2.

Comment:

Evaluator's Note: **Steps 4.2.1 through 4.2.6.1 are N/A.**

√ **Performance Step: 8**

OP-TM-534-901, Step 4.2.6.2
If RR-V-4B is not Open, then perform the following:
2. If RR-V-4B is not Open, then PLACE AH-E-1B in PTL.

Standard: Examinee determines that RR-V-4B cannot be opened and places AH-E-1B in PTL by rotating the Control Switch counter-clockwise and lifting until the Control Switch is captured in a lifted state (CR).

Comment:

Evaluator's Note: **Steps 4.2.7 through 4.2.13 are N/A.**

Evaluator's Note: **RR-PI-225 will not be in service due to RR-V-4B remaining closed. Therefore it will not get to less than 75 psig.**

√ **Performance Step: 9**

OP-TM-534-901, Step 4.2.14.1
If any of the following are > 75 psig on coolers in service:

- RR-PI-224
- RR-PI-225
- RR-PI-226

then perform the following:

- OPEN RR-V-5.

Standard: Examinee verifies that the coolers are > 75 psig and opens RR-V-5 by pressing the red "open" pushbutton

Comment:

√ **Performance Step: 10**

OP-TM-534-901, Step 4.2.14.2

If any of the following are > 75 psig on coolers in service:

- RR-PI-224
- RR-PI-225
- RR-PI-226

then perform the following:

2. If < 52 psig on coolers in service, then JOG CLOSED RR-V-5 to maintain coolers in service > 52 psig.

Standard:

Examinee presses the green "close", red "open", pushbuttons associated with RR-V-5, as appropriate, to ensure RR-PI-224 and RR-PI-226 indicate greater than 52 psig and less than 75 psig

Comment:

Terminating Cue:

When system pressure is stabilized using RR-V-5: Evaluation on this JPM is complete.

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 NRC JPM E

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- The Plant is at 100% power.
- ICS is in full AUTO.
- There is a small steam leak inside Containment.
- The Operations Director is informed of the situation.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

INITIATING CUE: The Control Room Supervisor has directed you to initiate Reactor Building Emergency Cooling using OP-TM-534-901, RB Emergency Cooling Operations.

TIME CRITICAL: No

Facility:	THREE MILE ISLAND UNIT 1	Task No.:	73101010
Task Title:	Return 1C 480V Bus to the Normal Power Supply	JPM No.:	2014 ILT NRC JPM F
K/A Reference:	SYS 062 A4.01 3.3/3.1	New JPM	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- A loss of offsite power occurred two hours ago, and has subsequently been restored.
- 1C 480V Bus is currently energized from the 1N Bus Cross Tie.
- No loads were reduced on the 1N 480V Bus.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

Task Standard: Return 1C 480V Bus to the Normal Power Supply.

Required Materials: None

General References: OP-TM-731-901, ENERGIZE 1C 480V BUS USING 1N BUS CROSS TIE, Rev. 2

1107-11, TMI Grid Operations, Rev 30

Handout: OP-TM-731-901, ENERGIZE 1C 480V BUS USING 1N BUS CROSS TIE, Rev. 2, signed off through step 4.2.9

Initiating Cue: The SM/ED directs you to restore normal power to the 1C 480V Bus IAW OP-TM-731-901, ENERGIZE 1C 480V BUS USING 1N BUS CROSS TIE.

Time Critical Task: No

Validation Time: 10 minutes

SIMULATOR SETUP

1. IC-16 (Temporarily snapped in IC-124)

   a. Insert ED01 immediately. Once in, delete malfunction.
   b. Perform OP-TM-AOP-020 through Step 5.3.1 (including Attachment 2)
   c. Perform OP-TM-731-901 through Step 4.2.9
   d. Ensure EDG Voltage is less than 50 V difference with A and D 4KV
   e. Start SC-P-1B and place SC-P-1C in PTL
   f. Place C1-02 in PTL.
   g. Place 1C-02 in PTL.
   h. 10A1S23-ZDILTCA43S(1) AUTO OFF
   i. Ensure MUMMT=10000.0
   j. FREEZE the simulation.

2. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator Cue: **Provide a copy of OP-TM-731-901, filled out through step 4.2.9**

Performance Step: 1 ***OP-TM-731-901 Step 5.1***
When 1A 4160V Bus is energized and SM/ED concurrence has been obtained to restore normal power to the 1C bus, then CONTINUE.

Standard: The Examinee verifies that the 1A 4160V Bus is energized and that SM/ED concurrence has been obtained

Comment:

Performance Step: 2 ***OP-TM-731-901 Step 5.2***
If 1A and 1D 4160 Volt bus voltage difference is greater than 50 volts, then
a. Place Aux Xfmr 1A load tap changer in manual IAW 1107-11.
b. Place Aux Xfmr 1B load tap changer in manual IAW 1107-11.
c. ADJUST Aux Xfmr LTC associated with the lower voltage to reduce the difference to less than 50 volts.

Standard: The Examinee observes that 1A and 1D 4160 Volt bus voltage difference is NOT greater than 50 volts and N/A's the step.

Comment:

Performance Step: 3 ***OP-TM-731-901 Step 5.3***
VERIFY 1C-02 is OPEN.

Standard: Examinee VERIFIES 1C-02 is Open by the switch in PTL and no associated lights are lit.

Comment:

√ **Performance Step: 4**
OP-TM-731-901 Step 5.4
ENSURE C1-02 is CLOSED.

Standard:
Examinee observes that C1-02 is in Pull-to-Lock and closes C1-02 by pushing inward and then fully clockwise, verifying red light lit, green light not lit, and red flag indicated.

Comment:

Performance Step: 5
OP-TM-731-901 Step 5.5
ANNOUNCE "Restoring the 1C 480V bus to normal power source".

Standard:
The Examinee announces "Restoring the 1C 480V bus to normal power source".

Comment:

Evaluator Note: **The following two steps require two-handed operation.**

√ **Performance Step: 6**
OP-TM-731-901 Step 5.6
HOLD 1C-02 extension control switch in the CLOSED position.

Standard:
Examinee holds 1C-02 extension control switch in the CLOSED position.

Comment:

√ **Performance Step: 7**
OP-TM-731-901 Step 5.7
OPEN T2-C2.

Standard:
The Examinee Opens T2-C2 while still holding 1C-02 extension control switch in the CLOSED position.

Comment:

OP-TM-731-901 Step 5.8

Performance Step: 8 When 1C-02 is closed, then release 1C-02 extension control.

Standard: The Examinee VERIFIES 1C-02 is closed and then releases the 1C-02 extension control.

Comment:

OP-TM-731-901 Step 5.9

Performance Step: 9 OPEN 1N-12.

Standard: The Examinee Opens 1N-12 by rotating the Control Switch counter-clockwise and verifying green indicating flag and light.

Comment:

OP-TM-731-901 Step 5.10

Performance Step: 10 ENSURE both Aux. Transformer load tap changers are in AUTO.
1A Aux Transformer LTC in AUTO IAW 1107-11.
1B Aux Transformer LTC in AUTO IAW 1107-11.

Standard: The Examinee VERIFIES 1A and 1B Aux Transformers are in AUTO.

Comment:

OP-TM-731-901 Step 5.11

Performance Step: 11 If 1N Unit 1C was opened to reduce N bus load, then CLOSE 1N Unit 1C

Standard: The Examinee determines from the initial conditions and/or Attachment 1 of OP-TM-731-901 that 1N Unit 1C was not opened and N/A's the step.

Comment:

OP-TM-731-901 Step 5.12

Performance Step: 12 PLACE the following in Normal-after-stop

- VA-P-1A Main Vacuum Pump A
- VA-P-1C Main Vacuum Pump C
- SC-P-1A Secondary Closed Cooling Pump A
-

Standard: The Examinee places the following in Normal-after-Stop:

- VA-P-1A Main Vacuum Pump A
- VA-P-1C Main Vacuum Pump C
- SC-P-1A Secondary Closed Cooling Pump A

Comment:

OP-TM-731-901 Step 5.13

Performance Step: 13 If SC-P-1C is in PTL, then PLACE SC-P-1C in Normal-After-Stop.

Standard: The Examinee determines SC-P-1C is in PTL and places SC-P-1C in Normal-After-Stop.

Comment:

OP-TM-731-901 Step 5.14

Performance Step: 14 ENSURE all breakers on Attachment 1 are CLOSED.

Standard: The Examinee determines that there are no breakers listed on Attachment 1.

Comment:

Terminating Cue: **When OP-TM-731-901 Step 5.14 is completed, the JPM can be terminated.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 ILT NRC JPM F

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: __________________

INITIAL CONDITIONS:

- A loss of offsite power occurred two hours ago, and has subsequently been restored.
- 1C 480V Bus is currently energized from the 1N Bus Cross Tie.
- No loads were reduced on the 1N 480V Bus.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

INITIATING CUE: The SM/ED directs you to restore normal power to the 1C 480V Bus IAW OP-TM-731-901, ENERGIZE 1C 480V BUS USING 1N BUS CROSS TIE.

TIME CRITICAL: No

Facility:	TMI Unit 1	Task No.:	66101004
Task Title:	Respond IAW OP-TM-MAP-C0101 Alarm Response with Failure – Alternate Path	JPM No.:	2014 ILT NRC JPM G
K/A Reference:	072 A3.01 (2.9 / 3.1)	2011 NRC JPM G	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor is operating at 100% power with ICS in full automatic.
- No Maintenance or surveillances are scheduled for this shift.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

Task Standard: Place Control Building Ventilation in the Emergency Recirculation mode.

Required Materials: None

General References: OP-TM-MAP-C0101, Radiation Level HI, Rev 2A
OP-TM-826-901, CONTROL BUILDING VENTILATION SYSTEM RADIOLOGICAL RESPONSE OPERATIONS, Rev 2

Handouts: None

Initiating Cue: Respond to the cues and indications given by the simulator as well as any input from the CRS.

Time Critical Task: No

Validation Time: 10 Minutes

SIMULATOR SETUP

1. Reset the simulator to IC 16 (Temporarily snapped into IC-127)
2. Insert the following Malfunctions:

   RM01G, AH-E-17A fails to trip on interlock, insert immediately

   13A6S06ZDICSAHE18B(5) str to OFF, AH-E-18B fails to start, insert immediately

   Create or Verify the following Batch File (RMA1.bat)

   NOTE: Current batch file has a ramp time of 1 min. This scenario requires a THREE (3) min ramp time so batch file must be changed for this scenario.

   Set RMPASSWORD = 168

   Set RM:NEWFILE = True

   Set RMRAMPIN = 3

   Set RMARMA1Gnew = 3000

   Set RMARMA1Pnew = 4020
3. When the above steps are completed for this and other JPMs to be run concurrently then validate, if not previously validated, the concurrently run JPMs using the JPM Validation Checklist.
4. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator Note: **The examinee may recognize that the Automatic actions of C-1-1 did not occur and may perform the actions IAW OS-24.**

ICO Cue: **When directed, type into expert command: bat RMA1.bat**

Evaluator Cue: **Acknowledge condition and entry into OP-TM-MAP-C0101.**

Performance Step: 1 ***OP-TM-MAP-C0101, Step 4.1***
ANNOUNCE alarm over plant page and radio.

Standard: Examinee announces RM-A-1 Hi Alarm over the plant page and radio.

Comment:

ICO Cue: **Acknowledge, as RadPro, to verify the alarm and determine the source.**

Performance Step: 2 ***OP-TM-MAP-C0101, Step 4.2***
Notify Radiation Protection to verify the alarm and determine the source.

Standard: Examinee notifies Radiation Protection to verify the alarm and determine the source.

Comment:

Examiner's Note: **The candidate will review the next step but it will not be applicable C-1-1 alarms with RM-A-1 in High Alarm.**

Examiner's Note: **If requested to evaluate donning SCBAs, report "No SCBAs are required".**
If requested to evaluate EAL's, acknowledge the request.

Performance Step: 3

OP-TM-MAP-C0101, Step 4.3
IAAT High Alarm is Lit, then perform the following:
- PERFORM OP-TM-826-901, " Control Building Ventilation System Radiological Response Operations":
- EVALUATE donning SCBA's.
- REQUEST SM to evaluate Emergency Action Levels (EALs).

Standard: Examinee verifies RM-A-1 High alarm is Lit (PRF), and goes to OP-TM-826-901.

Comment:

Examiner's Note: **ALTERNATE PATH BEGINS**

√ **Performance Step: 4**

OP-TM-826-901, Step 4.1.2
ENSURE the following fans are shutdown:
- AH-E-17A and AH-E-17B
- AH-E-95A and AH-E-95B
- AH-E-20A and AH-E-20B

Standard: Examinee ensures AH-E-17B, AH-E-95A/B, AH-E-20A/B are shutdown.
Examinee recognizes that AH-E-17A is running and secures AH-E-17A, by rotating extension control in the counter-clockwise direction (H&V A).
Examinee recognizes that AH-E-20A is running and secures AH-E-20A, by rotating extension control in the counter-clockwise direction (H&V A).

Comment:

Performance Step: 5	***OP-TM-826-901, Step 4.1.3*** SHUTDOWN AH-E-19A and AH-E-19B.

Standard: Examinee verifies AH-E-19B secure and secures AH-E-19A by rotating extension control in the counter-clockwise direction (H&V A).

Comment:

OP-TM-826-901, Step 4.1.4

Performance Step: 6 ENSURE AH-D-28 or AH-D-617 are CLOSED.

Standard: Examinee ensures AH-D-28 or AH-D-617 is CLOSED by observation of indication on H&V Center and/or PCR.

Comment:

OP-TM-826-901, Step 4.1.5

Performance Step: 7 PLACE ext. control for AH-E-93/94A and AH-E-93/94B to the OFF position.

Standard: Examinee places ext. controls for AH-E-93/94A and AH-E-93/94B to the OFF position on H&V Center.

Comment:

OP-TM-826-901, Step 4.1.6

Performance Step: 8 START AH-E-18B (A) if AH-E-17A (B) was previously operating.

Standard: Examinee attempts to start AH-E-18B (H&V B), by rotating extension control to start and waiting for discharge damper to drive to the open position, recognizes it does not start.

Comment:

Evaluator Cue: **When the candidate states that there is a 2 minute wait, announce "time compression is in effect and 2 minutes has elapsed".**

OP-TM-826-901, Step 4.1.7

√ **Performance Step: 9** If the opposite train of ventilation is unavailable, then WAIT 2 minutes after AH-E-17A (B) was shutdown and START AH-E-18A (B).

Standard: Examinee waits 2 minutes
Examinee starts AH-E-18A by rotating extension control on H&V A clockwise and holding until the discharge damper travels and the RED light comes on indicating AH-E-18 contactor picked up.

Comment:

OP-TM-826-901, Step 4.1.8

Performance Step: 10 ENSURE AH-E-19A or B is operating.

Standard: Examinee ensures AH-E-19A is operating, by observing RED light (H&V A).

Comment:

OP-TM-826-901, Step 4.1.9

Performance Step: 11 ENSURE AH-E-95A or B is operating.

Standard: Examinee ensures AH-E-95A is operating by observing RED light H&V Center.

Comment:

ICO Cue: **Acknowledge, as an NLO, to start AH-E-90 and AH-E-91.**

OP-TM-826-901, Step 4.1.10

Performance Step: 12 START AH-E-90 and AH-E-91.

Standard: Examinee orders an NLO to START AH-E-90 and AH-E-91.

Comment:

Terminating Cue: **When AH-E-18A has been started and the order has gone out to an NLO to start AH-E-90/91: Evaluation on this JPM is complete.**

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 ILT NRC JPM G

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- The Reactor is operating at 100% power with ICS in full automatic.
- No Maintenance or surveillances are scheduled for this shift.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.

INITIATING CUE:

Respond to the cues and indications given by the simulator as well as any input from the CRS.

TIME CRITICAL

No

Facility:	THREE MILE ISLAND UNIT 1	Task No.:	82401001
Task Title:	Initiate and Isolate a Reactor Building Purge – Alternate Path	JPM No.:	2014 ILT NRC JPM H
K/A Reference:	SYS 029 K1.01 3.4/3.7	Bank JPM, TMI08 NRC JPM G	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor is in Hot Shutdown in preparation for a refueling outage.
- Normal equipment lineups exist.
- A Reactor Building Purge is being started IAW OP-TM-823-406, RB Purge – Containment Closed.
- The maximum allowable flow per permit is 47,500 scfm.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- An Auxiliary Operator is available to report AH-TI-6A and AH-TI-6B temperatures.
- An Auxiliary Operator is available to adjust AH-PC-1146 as needed.

Task Standard: RB Purge is initiated and then isolated following an RM-G-9G High Radiation alarm.

Required Materials: Key #2

General References: OP-TM-823-406, RB Purge Containment Closed, Rev. 9
OP-TM-MAP-C0101, Radiation Level Hi, Rev. 2A

	6610-ADM-4250.12, Releasing Radioactive Gaseous Effluents – Reactor Building Purge, Rev 16, signed off through Step 3.3
Handout:	OP-TM-823-406, RB Purge Containment Closed, Rev. 9, signed off through Step 4.6 and Step 4.22 is marked as N/A
Initiating Cue:	The CRS directs you to INITIATE a Reactor Building Purge IAW OP-TM-823-406, RB Purge Containment Closed, not to exceed a rate of 20,000 scfm.
Time Critical Task:	No
Validation Time:	30 minutes

SIMULATOR SETUP

1. Initialize the Trainer to Temp IC 128, Hot Shutdown
    a. INSERT MALFUNCTION RM01L RM-A9 INTERLOCK FAILURE IMMEDIATELY.
    b. PLACE MALFUNCTION RM04H RM-A-9G ATMOSPHERIC RAD MONITOR FAILS HIGH ON EVENT #1.
2. Complete OP-TM-823-406, RB Purge – Containment Closed, signed off through Step 4.6 and Step 4.22 is marked as N/A
3. FREEZE the simulation.
4. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Procedure Note: **Fan suction damper will open allowing fan to start when fully open.**

Procedure Note: **CAUTION: To prevent damage to makeup duct containing AH-D-225, do not operate the purge system if total purge flow (AH-FR-148A) minus RB exhaust flow (AH-FR-148B or AH-FR-909) exceeds 36,000 SCFM.**

√ **Performance Step: 1**
OP-TM-823-406 Step 4.7
START the following:
- AH-E-7A
- AH-E-7B

Standard: The Examinee starts AH-E-7A by rotating the control switch in the clockwise direction and releasing, observing red running light lit and green secured light not lit (PL).
The Examinee starts AH-E-7B by rotating the control switch in the clockwise direction and releasing, observing red running light lit and green secured light not lit (PL).

Comment:

Evaluator Cue: **AH-PC-1146 is normally set at 39.5. Role play as Auxiliary Operator to locally adjust AH-PC-1146 to the desired position.**

Performance Step: 2
OP-TM-823-406 Step 4.8
ENSURE AH-PC-1146 is set to 9.5 for single AH-E-7 operation or 39.5 for two AH-E-7 operation.

Standard: The Examinee ensures AH-PC-1146 is set to 39.5.

Comment:

√ **Performance Step: 3** ***OP-TM-823-406 Step 4.9***
OPEN AH-V-1A.

Standard: Examinee opens AH-V-1A by pressing the red open pushbutton and verifying that the valve is open by the red light being lit and the green light not being lit (PL).

Comment:

Evaluator Cue: **When the examinee has located the Key locker near the LWDS panel, hand Key #2 to the examinee.**

√ **Performance Step: 4** ***OP-TM-823-406 Step 4.10***
PLACE lock key switch for AH-V-1B in OPENING PERMITTED.

Standard: The Examinee places the lock key switch for AH-V-1B in OPENING PERMITTED position by inserting Key #2 into the appropriate slot and turning it clockwise to the OPENING PERMITTED position (PL).

Comment:

√ **Performance Step: 5** ***OP-TM-823-406 Step 4.11***
OPEN AH-V-1B.

Standard: Examinee opens AH-V-1B by pressing the red open pushbutton and verifying that the valve is open by the red light being lit and the green light not being lit (PL).

Comment:

Performance Step: 6

OP-TM-823-406 Step 4.12
PLACE lock key switch for AH-V-1B in OPENING DEFEATED.

Standard:

The Examinee places the lock key switch for AH-V-1B in OPENING DEFEATED position by turning Key #2 counter-clockwise to the OPENING DEFEATED position and removing Key #2 from the appropriate slot (PL).

Comment:

Evaluator Note: **Step 4.13 and 4.14 are N/A.**

Performance Step: 7

OP-TM-823-406 Step 4.15
If one of the following conditions exists:

- Maximum permissible purge rate IAW Rad Permit is ≤ 25,000 scfm.
- Purge valves are limited to 30° open.
- Only one purge exhaust fan is operating.
- Only one purge supply fan is operable.

then START one purge supply fan, otherwise START both of the following:

- AH-E-6A
- AH-E-6B

Standard:

The Examinee determines that purge valves are limited to 30° open and starts EITHER AH-E-6A or AH-E-6B by rotating the control switch in the clockwise direction and releasing, observing red running light lit and green secured light not lit (PL).

Comment:

√ **Performance Step: 8**

OP-TM-823-406 Step 4.16
OPEN AH-V-1D.

Standard:

Examinee opens AH-V-1D by pressing the red open pushbutton and verifying that the valve is open by the red light being lit and the green light not being lit (PL).

Comment:

OP-TM-823-406 Step 4.17

√ **Performance Step: 9** PLACE lock key switch for AH-V-1C in OPENING PERMITTED.

Standard: The Examinee places the lock key switch for AH-V-1C in OPENING PERMITTED position by inserting Key #2 into the appropriate slot and turning it clockwise to the OPENING PERMITTED position (PL).

Comment:

OP-TM-823-406 Step 4.18

√ **Performance Step: 10** OPEN AH-V-1C.

Standard: Examinee opens AH-V-1C by pressing the red open pushbutton and verifying that the valve is open by the red light being lit and the green light not being lit (PL).

Comment:

OP-TM-823-406 Step 4.19

Performance Step: 11 PLACE lock key switch for AH-V-1C in OPENING DEFEATED.

Standard: The Examinee places the lock key switch for AH-V-1C in OPENING DEFEATED position by turning Key #2 counter-clockwise to the OPENING DEFEATED position and removing Key #2 from the appropriate slot (PL).

Comment:

Evaluator Note: **Step 4.20 and 4.21 are N/A.**

OP-TM-823-406 Step 4.22

Performance Step: 12 MARK FR-148 with start time, date, and release number.

Standard: This step is N/A since the recorder is now digital.

Comment:

	OP-TM-823-406 Step 4.23
√ **Performance Step: 13**	ADJUST RB Purge Manual Loader Purge Rate (AH-D-8B-EX1) to establish desired purge rate (not to exceed maximum allowable purge rate) and maintain RB pressure near 0 psig.
Standard:	The Examinee adjusts the RB Purge Manual Loader Purge Rate by dialing AH-D-8B-EX1 as necessary to establish desired flow rate of approximately 20,000 scfm, given in the initiating cue (H&V), while ensuring RB pressure is maintained near 0 psig by observing RB pressure meters (PC).
Comment:	

Alternate Path Begins

Booth Operator Cue:	**When directed by the examiner, Insert EVENT #1**
Evaluator Note:	**The Examinee may immediately close AH-V-1A-D based on OS-24, section 4.3.5 Reactor "At Power" Protocol:** ***Any time an automatic control or interlock functions fails to perform as designed and there is no specific procedure direction, the reactor operator should take action to compensate directly for the failure.***
Evaluator Cue:	**Acknowledge as Radiation Protection and/or the Shift Manager for possible notification/direction.**
Evaluator Note:	**OP-TM-MAP-C0101 has an IAAT at step 4.6 that is applicable upon entry into the alarm response. The examinee may perform steps 4.1-4.5, but these are not necessary prior to step 4.6**

√ **Performance Step: 14**

OP-TM-MAP-C0101, RM-A-9 Step 4.6.1

IAAT high alarm is Lit, then perform the following:
If fuel handling is not in progress, then ENSURE the following are Closed:

- AH-V-1A
- AH-V-1B
- AH-V-1C
- AH-V-1D

Standard:

The Examinee:

- Closes AH-V-1A by pressing the green closed pushbutton and verifying that the red Open light is not lit and the green closed light is lit (PL).
- Closes AH-V-1B by pressing the green closed pushbutton and verifying that the red Open light is not lit and the green closed light is lit (PL).
- Closes AH-V-1C by pressing the green closed pushbutton and verifying that the red Open light is not lit and the green closed light is lit (PL).
- Closes AH-V-1D by pressing the green closed pushbutton and verifying that the red Open light is not lit and the green closed light is lit (PL).

Comment:

Terminating Cue: **When AH-V-1A, AH-V-1B, AH-V-1C and AH-V-1D are closed the JPM can be terminated.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 ILT NRC JPM H

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- The Reactor is in Hot Shutdown in preparation for a refueling outage.
- Normal equipment lineups exist.
- A Reactor Building Purge is being started IAW OP-TM-823-406, RB Purge – Containment Closed.
- The maximum allowable flow per permit is 47,500 scfm.
- You are the ARO.
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- An Auxiliary Operator is available to report AH-TI-6A and AH-TI-6B temperatures.
- An Auxiliary Operator is available to adjust AH-PC-1146 as needed.

INITIATING CUE:

The CRS directs you to INITIATE a Reactor Building Purge IAW OP-TM-823-406, RB Purge Containment Closed, not to exceed a rate of 20,000 scfm.

TIME CRITICAL

No

Facility:	Three Mile Island	Task No.:	73401002
Task Title:	RETURN A BATTERY CHARGER TO SERVICE	JPM No.:	2014 NRC JPM I
K/A Reference:	058 AA1.03 3.1 / 3.3		Bank TQ-TM-105-734-J001

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Reactor is at 100% power.
- 1E battery charger is shutdown following maintenance.
- The 1A battery charger has failed and is out of service with all of its associated breakers OPEN.
- The 1E battery charger is available to be placed in service.
- You are the Third Reactor Operator (RO).

Task Standard: The 1E battery charger placed in-service to replace the 1A battery charger.

Required Materials: 1107-2C, Vital DC Electrical System, Revision 12

General References: 1107-2C, Vital DC Electrical System, Revision 12

Handout: 1107-2C, Vital DC Electrical System, all steps signed off up to 3.1.3.1

Initiating Cue: The CRS has directed you to place the 1E battery charger in-service to replace the 1A battery charger in accordance with 1107-2C.

Time Critical Task: N/A

Validation Time: 25 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR CUE: **Provide a copy of 1107-2C, Vital DC Electrical System**

EVALUATOR CUE: **If Examinee establishes communications with the Control Room, role play as a Control Room Operator.**

EVALUATOR CUE: **If asked about prerequisites, state that " all Prerequisites have been completed and Shift Manager permission has been obtained as required".**

Performance Step: 1 Locate 1E Battery Charger.

Standard: Examinee proceeds to the 1E Battery Charger in the Inverter Room on the 2nd floor of the Control Tower.

Comment:

EVALUATOR CUE: **As required, simulate or state that the positions of the handles for both the AC and DC breakers on the front of the 1E battery charger, indicate down.**

PROCEDURE NOTE: **When placing a battery charger in standby operation, or placing it in service, it is important to follow the sequence exactly as written. This will prevent damage to the charger and prevent possible loss of a vital AC Bus.**

	1107-2C, Step 3.1.3.1
Performance Step: 2	Verify the AC and DC breakers on the front of the battery charger are OPEN.
Standard:	Examinee verifies the "AC CKT BKR" and the "DC CKT BKR" switches are open (in the down position) on the front of the 1E Battery Charger.
Comment:	

EVALUATOR CUE: **When contacted as the Control Room as to which panel the charger should be started up to supply, state "A" DC panel unit #1.**

	1107-2C, Step 3.1.3.2
Performance Step: 3	IF the battery charger being returned to service is the 1E or 1F charger, THEN get direction from the CRS/SM as to which panel the charger should be started up to supply. (If not 1E or 1F then N/A) ____________ DC Panel
Standard:	Examinee recognizes that the battery charger is the 1E. Examinee requests info from the Control Room and writes "A" DC panel unit #1 on the line.
Comment:	

EVALUATOR CUE: **As required, simulate or state that the position of the handle on #1CL on 1A ES MCC is down (\).**
When simulated closed, simulate or state that the position of the handle on #1CL on 1A ES MCC is up (/).

1107-2C, Step 3.1.3.3

√ **Performance Step: 4** CLOSE the AC 480 volt supply breaker to the charger being started up, as listed below: (N/A those chargers not being started up.)

Standard: Examinee simulates closing the 480V AC Power Supply breaker for the 1E Station Battery Charger, #1CL on 1A ES MCC and N/A's the other lines in this step.

Comment:

EVALUATOR CUE: **As required, simulate or state that the position of the handles on "A" DC panel units #1 and #2 are down(\). When simulated closed, simulate or state that the position of the handle on "A" DC panel unit #1 is up (/).**

PROCEDURE NOTE: **1E and 1F battery chargers have two breakers each. Only one can be closed in at a time and the other breaker must be verified open prior to closing one.**

1107-2C, Step 3.1.3.4

√ **Performance Step: 5** Close the DC switch on the DC Dist panel for the charger to be started up. (N/A those chargers not being started up.)

Standard: Examinee verifies "1A" DC panel unit #2 is open and simulates closing "1A" DC panel unit #1. Examinee N/A's all other lines in this step

Comment:

EVALUATOR CUE: **When simulated closed, simulate or state that the position of DC breaker on the front of the 1E charger is closed.**

EVALUATOR NOTE: **Performing Steps 6 and 7 out of order could cause possible damage to the battery chargers and is grounds for JPM failure.**

PROCEDURE NOTE: **When starting up a battery charger, it is possible to damage the rectifier stack or blow the anode fuse if the DC breaker is not closed first.**

	1107-2C, Step 3.1.3.5
√ **Performance Step: 6**	CLOSE the DC circuit breaker on the front of the charger.
Standard:	Examinee simulates closing the DC circuit breaker on the front of the 1E charger.
Comment:	
EVALUATOR CUE:	**When simulated closed, simulate or state that the position of AC breaker on the front of the 1E charger is closed.**
	1107-2C, Step 3.1.3.6
√ **Performance Step: 7**	Close the AC circuit breaker on the front of the charger.
Standard:	Examinee simulates closing the AC circuit breaker on the front of the 1E charger.
Comment:	
Terminating Cue:	**After the AC circuit breaker is closed on the 1E battery charger: This JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 NRC JPM I

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- The Reactor is at 100% power.
- 1E battery charger is shutdown following maintenance.
- The 1A battery charger has failed and is out of service with all of its associated breakers OPEN.
- The 1E battery charger is available to be placed in service.
- You are the Third Reactor Operator (RO).

INITIATING CUE: The CRS has directed you to place the 1E battery charger in-service to replace the 1A battery charger in accordance with 1107-2C.

TIME CRITICAL No

Facility: THREE MILE ISLAND UNIT 1 | Task No.: 41101004

Task Title: Locally/Manually Operate a Turbine Bypass Valve | JPM No.: 2014 NRC JPM J

K/A Reference: 041 A4.08 (3.0/3.1) | Bank JPM TQ-TM-105-411-J100

Examinee: | NRC Examiner:

Facility Evaluator: | Date:

Method of testing:

Simulated Performance: X | Actual Performance:

Classroom ______ Simulator ______ Plant ___X___

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- A loss of ICS Hand and Auto Power has occurred
- The crew has entered OP-TM-AOP-025, Loss of ICS Hand and Auto Power.
- The Reactor has been tripped and OP-TM-EOP-001 has been initiated.
- FW-P-1A and FW-P-1B have been tripped.
- Emergency Feedwater has been initiated.
- You are an extra Reactor Operator on shift.

Task Standard: Simulated MS-V-3C being controlled locally in Manual.

Required Materials: None

General References: OP-TM-411-451, Manual Control of TBVs/ADVs, Revision 6

Handout: Attachment 7.1 of OP-TM-411-451, Manual Control of TBVs/ADVs, Revision 6

Initiating Cue: Take local control of MS-V-3C IAW OP-TM-411-451, Attachment 7.1, Local Operation of the TBV's (MS-V-3s), and await further direction from the Control Room.

Time Critical Task: NO

Validation Time: 15 Minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR CUE: **Provide the candidate a copy of OP-TM-411-451, Attachment 7.1, Local Operation of TBVs (MS-V-3s).**

EVALUATOR CUE: **The sleeve for MS-V-3C will slide up/down as the handwheel is rotated in the direction of the arrow on the handwheel.**

Performance Step: 1 Obtain/review procedure.

Standard: Candidate proceeds to TB 322' elevation, West side of Main Condenser and reviews OP-TM-411-451, Attachment 7.1.

Comment:

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to align the holes in the sleeve and stem, state "the holes are aligned".**
If candidate does not correctly describe rotating the handwheel to align the holes in the sleeve and stem, state "the holes are not aligned".

OP-TM-411-451, Attachment 7.1, Step 2

Performance Step: 2 Turn the handwheel to align the hole in the sleeve with the hole in the stem (either set of holes will work)

√ **Standard:** Candidate simulates rotating the handwheel to align the holes in the sleeve and the stem using either set of holes.

Comment:

EVALUATOR CUE: **If candidate correctly describes inserting the pin, state "the pin is inserted".**
If candidate does not correctly describe inserting the pin, state "the pin is not inserted".

Performance Step: 3

OP-TM-411-451, Attachment 7.1, Step 3
Insert pin (located on valve housing, attached to a chain)

√ **Standard:**

Candidate locates the pin and simulates inserting the pin into the holes of the sleeve and stem on the manual operator.

Comment:

PROCEDURE NOTE: **Auto/Manual switch for MS-V-3s is located on side of positioner box.**

EVALUATOR CUE: **If candidate correctly describes positioning the switch, state "the switch is in manual".**
If candidate does not correctly describe positioning the switch, state "the switch is in auto".

Performance Step: 4

OP-TM-411-451, Attachment 7.1, Step 4
Press and rotate Auto/Manual switch to the Manual position.

- Switch is "Press to Turn"
- Switch must be rotated 90 degrees counter clockwise.

√ **Standard:**

Candidate simulates pressing and rotating the Auto/Manual switch 90 degrees counter clockwise to the Manual position.

Comment:

EVALUATOR CUE: **If candidate correctly describes opening the actuator equalizing valve, state "the actuator equalizing valve is open".**
If candidate does not correctly describe opening the actuator equalizing valve, state "the actuator equalizing valve is closed".

	Performance Step: 5	***OP-TM-411-451, Attachment 7.1, Step 5*** Open the actuator Equalizer valve (located near the valve operator and marked as Equalizing Valve).
√	**Standard:**	Candidate simulates opening the actuator equalizing valve by rotating the handwheel counter clockwise to the fully open position.
	Comment:	
	Performance Step: 6	***OP-TM-411-451, Attachment 7.1, Step 6*** Maintain Header Pressure within limits by adjusting TBV/ADV handwheel. Position MS-V-3C as needed using handwheel.
	Standard:	Candidate contacts Control Room and informs them that MS-V-3C is in Manual and awaits instructions to position the valve.
	Comment:	
	EVALUATOR CUE:	**When contacted, state "Main Header Pressure is too high. Throttle MS-V-3C two and one half turns open".**
	EVALUATOR CUE:	**If candidate correctly describes OPENING MS-V-3C two and one half turns, then when they call it in to the ARO in the Control Room respond with "Main Header Pressure is responding".** **If candidate does not correctly describe opening MS-V-3C two and one half turns, then when they call it in to the ARO in the Control Room respond with "Main Header Pressure is not responding".**
	Performance Step: 6	***OP-TM-411-451, Attachment 7.1, Step 6*** Throttle MS-V-3C two and one half turns open.
√	**Standard:**	Candidate simulates rotating the handwheel for MS-V-3C counter-clockwise two and one half turns.
	Comment:	

Terminating Cue: **After MS-V-3C is open two and one half turns, evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

Job Performance Measure No.: 2014 NRC JPM J

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ____________

Initial Conditions:

- A loss of ICS Hand and Auto Power has occurred
- The crew has entered OP-TM-AOP-025, Loss of ICS Hand and Auto Power.
- The Reactor has been tripped and OP-TM-EOP-001 has been initiated.
- FW-P-1A and FW-P-1B have been tripped.
- Emergency Feedwater has been initiated.
- You are an extra Reactor Operator on shift.

INITIATING CUE: Take local control of MS-V-3C IAW OP-TM-411-451, Attachment 7.1, Local Operation of the TBV's (MS-V-3s), and await further direction from the Control Room.

TIME CRITICAL: No

Facility: Three Mile Island Unit 1 Task No.: 21301002

Task Title: Pressurize the Core Flood Tanks JPM No.: 2014 NRC JPM K

K/A Reference: 006 A1.13 (3.5/3.7) Bank JPM TQ-TM-105-213-J100

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- The Plant is operating at 100% power.
- "A" Core Flood Tank Pressure is low.
- You are the Third Reactor Operator.

Task Standard: Nitrogen lined up to pressurize Core Flood Tank 1A.

Required Materials: None

General References: OP-TM-213-473, Raising CF-T-1A Nitrogen Pressure, Rev 3

Handout: OP-TM-213-473, Raising CF-T-1A Nitrogen Pressure, Rev 3, signed off through Step 4.1.3 and Step 4.1.4 is N/A.

Initiating Cue: As the CRS, I am directing you to raise Core Flood Tank Pressure using the Alpha Side Regulator IAW OP-TM-213-473, Raising CF-T-1A Nitrogen Pressure, starting at step 4.2.

Time Critical Task: No

Validation Time: 35 minutes (includes time to sign on RWP)

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open CF-V-10, state "the valve is open".**
If candidate does not correctly describes rotating the handwheel to open CF-V-10, state "the valve is closed".

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open NI-V-25, state "the valve is open".**
If candidate does not correctly describes rotating the handwheel to open NI-V-25, state "the valve is closed".

OP-TM-213-473, Step 4.2.1

Performance Step: 1 Open the following:

- CF-V-10
- NI-V-25

Standard: Examinee locates CF-V-10 in the Auxiliary Building, 305' elevation, in the cubicle behind the Seal Injection Filters.

√ Examinee simulates opening CF-V-10 by turning the valve in a counterclockwise direction.

Examinee locates NI-V-25 in the Auxiliary Building, 305' elevation, along the wall just South of th 1A 480V ES Valves MCC.

√ Examinee simulates opening NI-V-25 by turning the valve in a counterclockwise direction.

Comment:

EVALUATOR NOTE: **The Chemical Addition Room is the first door on the left when exiting the elevator in the Auxiliary Building, 3rd floor. The Nitrogen bottles are to the left as you enter the room.**

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open NI-V-98A, state "the valve is open".**
If candidate does not correctly describes rotating the handwheel to open NI-V-98A, state "the valve is closed".

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open NI-V-99, state "the valve is open".**
If candidate does not correctly describes rotating the handwheel to open NI-V-99, state "the valve is closed".

OP-TM-213-473, Step 4.2.2

Performance Step: 2 Open the following:

- NI-V-98A
- NI-V-99

Standard: Examinee locates NI-V-98A in the Auxiliary Building, Chemical Addition Room, on the 650# Nitrogen Header.

√ Examinee simulates opening NI-V-98A by turning the valve in a counterclockwise direction.

Examinee locates NI-V-99 in the Auxiliary Building, Chemical Addition Room, on the 650# Nitrogen Header.

√ Examinee simulates opening NI-V-99 by turning the valve in a counterclockwise direction.

Comment:

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open NI-V-81A, state "the valve is open".**
If candidate does not correctly describes rotating the handwheel to open NI-V-81A, state "the valve is closed".
If candidate begins to manipulate NI-V-81B, state "Raise Core Flood Tank Pressure using the 'A' regulator".

OP-TM-213-473, Step 4.2.3

Performance Step: 3 Align High Pressure to one or both NI-V-80A/B, 650# Nitrogen regulators as follows (N/A regulator not used):

- Open NI-V-81A and/or
- Open NI-V-81B

Standard: Examinee locates NI-V-81A in the Auxiliary Building, Chemical Addition Room, on the 650# Nitrogen Header.

√ Examinee simulates opening NI-V-81A by turning the valve in a counterclockwise direction.

Examinee N/A's NI-V-81B.

Comment:

EVALUATOR NOTE: **NI-PI-1090 is the high side pressure gauge.**
NI-PI-1091 is the low side pressure gauge.

EVALUATOR CUE: **If candidate correctly identifies NI-PI-1090 and NI-PI-1091, state "pressure indication has not changed".**

If candidate does not correctly identify NI-PI-1090 and NI-PI-1091, state "pressure indication has not changed".

OP-TM-213-473, Step 4.2.4

Performance Step: 4 Observe high and low side regulator pressure gauges to ensure regulator is reducing Nitrogen to approximately 650 psig.

Standard: Examinee identifies the pressure gauges to see if the regulator is reducing Nitrogen and recognizes no change in pressure.

Comment:

EVALUATOR CUE: **State "the NI-V-138 handle is in-line with the pipe (or 'as shown')".**

State "the NI-V-141 handle is 90 degrees to the left of the pipe".

EVALUATOR CUE: **If candidate correctly describes NI-V-141 valve manipulation, state "the NI-V-141 handle is in-line with the pipe (or 'as shown')".**

If candidate correctly describes valve manipulation, state "pressure has responded, low side pressure gauge indicates 650#".

If candidate does not correctly describe valve manipulation, state "pressure indication has not changed".

OP-TM-213-473, Step 4.2.5

Performance Step: 5 If Pressure does not come up on the high side gauge, then ensure open the following valves:

- NI-V-138
- NI-V-141

Standard: Examinee locates NI-V-138 in the Auxiliary Building, Chemical Addition Room.

Examinee determines NI-V-138 is open by the handle being in-line with the pipe.

Examinee locates NI-V-141 in the Auxiliary Building, Chemical Addition Room.

√ Examinee simulates opening NI-V-141 by turning the valve to be in-line with the pipe.

Comment:

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open NI-V-1011, state "the valve is open". If candidate does not correctly describes rotating the handwheel to open NI-V-1011, state "the valve is closed".**

EVALUATOR CUE: **If candidate correctly describes rotating the handwheel to open NI-V-79A, state "the valve is open". If candidate does not correctly describes rotating the handwheel to open NI-V-79A, state "the valve is closed".**

OP-TM-213-473, Step 4.2.6

Performance Step: 6 Align downstream side of one or both NI-V-80A/B, 650# Nitrogen Regulators, as follows (N/A regulator not used):

NI-V-80A	Position
• NI-V-1011	Open
• NI-V-79A	Open

Standard: Examinee locates NI-V-1011 in the Auxiliary Building, Chemical Addition Room.

√ Examinee simulates opening NI-V-1011 by turning the valve in a counterclockwise direction.

Examinee locates NI-V-79A in the Auxiliary Building, Chemical Addition Room.

√ Examinee simulates opening NI-V-79A by turning the valve in a counterclockwise direction.

Examinee N/A's NI-V-79B.

Comment:

Terminating Cue: **After NI-V-1011 and NI-V-79A have been opened, evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2014 NRC JPM K

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- The Plant is operating at 100% power.
- "A" Core Flood Tank Pressure is low.
- You are the Third Reactor Operator.

INITIATING CUE:

As the CRS, I am directing you to raise Core Flood Tank Pressure using the Alpha Side Regulator IAW OP-TM-213-473, Raising CF-T-1A Nitrogen Pressure, starting at step 4.2.

TIME CRITICAL:

No

Facility: Three Mile Island	Scenario No.: 1	Op Test No.: 289-2014-301	
Examiners:		Operators:	
Initial Conditions:	• (Temporary IC-241)		
	• 100% Power, MOL		
	• SBO OOS For Maintenance, expected to return to service in 10 hours		
	• Crane work is occurring on the West side of the Plant to stage new piping.		
	• NRC Authorization Code for today is AB12.		
Turnover:	Maintain 100% Reactor Power		
Critical Tasks:	• Minimize SCM (CT-7)		
	• Limit Uncontrolled Radiation Release (CT-21)		
	• Reduce Steaming/Isolate Affected SGs (CT-22)		

Event No.	Malf. No.	Event Type*	Event Description
1	MSR01	C CRS C URO C ARO	MSIV Inadvertent Closure, entry into OP-TM-PPC-L2204. (URO: Lowers power in ICS Auto, ARO: Opens MS-V-1A)
2	RW02C	TS CRS C ARO	NR-P-1C Trips, NR-P-1B Fails to Auto-Start, entry into OP-TM-MAP-B0105, and OP-TM-MAP-B0205 (ARO: Starts NR-P-1B from CR)
3	MU19D	C CRS C URO C ARO	Reactor Coolant Pump Seal Leakage, entry into OP-TM-AOP-040. (URO: Lower Reactor Power, ARO: Manually Control Feedwater Pumps)
4	ED09D	TS CRS C ARO	Loss of Vital Bus D, entry into OP-TM-AOP-018 (ARO: Restore Control Building Ventilation)
5	IC20	I CRS I URO I ARO	Total FW Demand Fails to Zero Volts, ICS Transient, entry into OP-TM-AOP-070. (URO/ARO: Coordinate to stabilize plant in ICS HAND control)
6	TH17B	TS CRS R URO N ARO	~30 gpm "B" OTSG Tube Leak (TS), entry into OP-TM-EOP-005 (URO: Guide 9)
7	RC39A TH16B	M CRS M URO M ARO	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, entry into OP-TM-EOP-005
8	MUR67 MUR94	C CRS C URO	MU-V-36 Fails to Open (URO: Maintains HPI flow greater than 115 GPM)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRC Scenario #1

Event #1: When the crew has accepted the watch, the Lead Examiner will cue the Closure of MS-V-1A. The crew will identify this by the green closed light lit, white test light lit (during travel) and the red open light not lit (after travel is complete) (CC). The crew will enter OP-TM-PPC-L2204, which will direct lowering power less than 90% and reopening MS-V1A.

When MS-V-1A has been opened, the scenario can continue.

Event #2: The Lead Examiner will cue the trip of the "C" Nuclear River Pump. "B" Nuclear River Pump fails to auto-start in standby, leaving only one (1) Nuclear River Pump running. One Nuclear River Pump may not be sufficient to cool both the Nuclear Service Closed Cooling System (NSCCW) and the Intermediate Closed Cooling System (ICCW).

It is considered a loss of NSCCW if NSCCW temperatures reach 100°F, and the following Critical Safety Functions are affected:

> **CSF 4**, Core Heat Removal: Provide the capability to remove core heat production at all times: Loss of Nuclear Services cooling function: RC pumps must shutdown. Natural Circulation will be used RCS heat removal.
>
> **CSF 8**, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems, and some containment isolation valves: Loss of Nuclear Services cooling function: Other CSFs are affected as follows: (1) the reliability of safety related power sources and instrumentation system is degraded by the loss of the control building chillers and (2) the reliability of the decay closed pump motors and emergency feed pump motors is degraded by the loss of cooling to the area ventilation coolers.
>
> **CSF 10**, Chemistry Control: Provide the means to monitor and control primary and secondary water chemistry in order to ensure the long term reliability of plant systems and limit the potential release of radioactive materials: Loss of Nuclear Services cooling function would result in the loss of the capability to obtain an RCS or OTSG sample.

It is considered a loss of ICCW if ICCW temperatures reach 120°F, and the following Critical Safety Functions are affected:

> **CSF 1**, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. Loss of Intermediate Component Cooling: The reactor is tripped in the event of loss of cooling to the CRD stators in order to prevent stator damage.

Loss of CRD stator cooling would not prevent CRD insertion on RPS actuation. Maintaining reactor shutdown is not affected by loss of IC component cooling.

CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. Loss of Intermediate Component Cooling: One of two RCP seal cooling methods is lost. Loss of seal injection would require RCP shutdown. If SI is lost, overheating of RCP seals is likely. If seal injection maintained, solid operation may be required due to the loss of letdown.

The crew will diagnose the trip of NR-P-1C by an amber disagreement light on the NR-P-1C control switch and Annunciator alarms A-1-5 and A-2-5. The ARO will manually start "B" Nuclear River Pump to provide sufficient cooling for NSCCW and ICCW. The CRS will identify and declare the following Tech Spec: 3.3.2.

When NR-P-1B is running and the Tech Spec has been declared, the scenario can continue.

Event #3: The Lead Examiner will cue the Reactor Coolant Pump Seal Leak on RC-P-1D. IAW OP-TM-AOP-040, RCP #1 SEAL FAILURE, Basis Document:

The objective is to shutdown the RCP before any further significant RCP damage occurs. The goal is to attempt to reduce power to allow stopping pump without having to trip the reactor. If tripping the RCP would challenge RPS, then the reactor will be tripped, the IMAs and symptom check performed and then the affected RCP tripped.

These actions should be performed promptly. If seal leakoff flow exceeds 8 gpm or temperature exceeds limits at seal water to radial bearing or #1 seal inlet, the RCP must be shutdown immediately. Once an RCP is tripped, #1 seal return is isolated (close MU-V-33) and the #2 seal becomes the primary seal.

The crew will diagnose the #1 Seal Leak on RC-P-1D by the PPC alarm, the digital recorder (PC), and Lab Seal D/P indicated abnormal (CC). The CRS will announce entry into OP-TM-AOP-040 and will determine that, based on Seal Leakage being greater than 6 gpm but less than 8 gpm, a power reduction will be made in order to secure the RCP.

The URO will have to reduce power with ICS in AUTO to secure the RCP.

Once the "D" Reactor Coolant Pump is tripped, then the scenario can continue.

Event #4: The Lead Examiner will cue the Loss of Vital Bus "D".

The effects of a loss of VBD which are significant to plant safety or operation are numerous. For each effect the required compensatory action is described in OP-TM-AOP-018.

This procedure stabilizes the plant and performs compensatory actions for equipment failures. It is considered a loss of Vital Bus "D" if the OTSGs are being used for RCS heat removal and an unplanned deenergization of VBD has occurred, and the following Critical Safety Functions are affected:

CSF 1, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. **Loss of VBD:** NI-4 and NI-8 are lost, but the remaining channels of nuclear instrumentation and incore detectors provide sufficient information to control power level and reactor power distribution.

CSF 6, Radiation Control and Control Room Habitability: Monitor and control the release of radiation to the environment. Maintain access to critical plant equipment and use of the Control Room. **Loss of VBD**: RM-L-6, RM-A-7, RM-A-4, and RM-A-6 are deenergized. Compensatory actions will be taken IAW ODCM requirements. Access to plant equipment and Control Room is not affected.

CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. **Loss of VBD:** VBD is deenergized. Ability to accomplish other Critical Safety Functions is not compromised.

CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. **Loss of VBD:** Ventilation will be lost to CB 322' Battery Rooms, Inverter Rooms, ES 480V Switchgear Rooms, and Remote Shutdown Area. Compensatory actions will be performed IAW OP-TM-AOP-034, "Loss of Control Building Cooling." Instrument air is not affected.

CSF 9, Fire Protection and Remote Shutdown Capability: Maintain means to prevent, detect and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. **Loss of VBD:** Loss of PRF annunciators disables alarms PRF-5-1, Relay Room Fire, PRF-7-1, IWFS/TS Bldg Fire, PRF-7-6, UPS Fire, and PRF-7-7, Process Center Fire. HVB-4-10 remains available to annunciate a fire in the Relay Room, and Relay Room CO2 fire suppression remains operable. Sprinkler systems remain operable in IWFS/TS Bldg, UPS room, and Processing Center.

The crew will diagnose the loss of Vital Bus "D" by the "D" Reactor Protection System Cabinet being deenergized, NI-8 indication deenergized (CC), Multiple annunciator alarms, including one for a failed inverter, "D" powered HSPS lights lit, and a loss of the right monitor of the Position Monitor Panel.

The ARO will place Radiation Monitor Interlock switches to Defeat, and restore Control Building, Auxiliary Building, and Fuel Handling Building Ventilation. The CRS will identify and declare the following Tech Spec: 3.5.5.2.

When the radiation monitor interlock switches are in defeat, ventilation is running and the Tech Spec has been declared, the scenario can continue.

Event #5: The Lead Examiner will cue Total FW Demand Fails to Zero Volts. This will cause an ICS transient, which if not responded to swiftly, will cause a Reactor Trip. The crew will diagnose the ICS failure by a rapid change in RCS pressure, multiple annunciator alarms, and/or changes in indications at multiple ICS stations. Entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET will be required based on RCS pressure not being controlled in ICS AUTO. "RCS pressure is not being controlled" requires the operator to make a subjective determination, based on their skills, training, and experience. A determination that RCS pressure is being controlled should include the following elements: 1) The reason for the transient is understood 2) RCS pressure response is consistent with the expected response for the event 3) Automatic or manual control in accordance with normal operating procedures is effectively controlling RCS pressure. A conservative assessment (i.e. concluding that RCS pressure is not being controlled) is appropriate when the three conditions above cannot be satisfied. ICS failures are one class of events that can lead to an upset in primary to secondary heat transfer. Most ICS failures can be mitigated by use of the appropriate manual control normal operating procedures.

This entry into OP-TM-AOP-070 is different from the others because FeedWater will lower significantly and the crew will need to establish ICS controls in manual. Once the plant is stabilized in ICS HAND control, the scenario can continue.

Event #6: The Lead Examiner will cue the "B" OTSG Tube Leak. Any OTSG tube leak causes an abnormal increase in the release of radioactive materials to the environment. The most fundamental objective is to minimize this release. The prioritized objectives of this procedure are:

- Maintain core cooling.
- Minimize the activity release to the atmosphere (minimize release duration, rate and concentration of radioisotopes, particularly iodine)
- Minimize the integrated tube leakage

30 seconds of MSSV actuation can release 75% of the iodine for the entire event. The main condenser provides for iodine removal due to the ability of water to absorb the iodine (at least temporarily) through the condensers 104 "partitioning factor". This phenomenon reduces off site does consequences to the point that the radiation limits listed in the EOP can not be reached regardless of the tube leak size and the number of fuel pin leaks. MSSV actuation provides an opportunity for failure resulting in an unisolable path for reactor coolant directly to the environment.

The crew will diagnose an OTSG tube leak based on RM-G-27, RM-A-5, and RM-A-15 indications (PR), Annunciator C-1-1 in alarm, and/or pressurizer level lowering (CC). The CRS will announce entry into OP-TM-EOP-005, OTSG TUBE LEAKAGE. This is a reactivity manipulation event. The URO will perform reactor shutdown with ICS in HAND. The ARO may lineup to feed to the RCS from the "B" RBCT for inventory control. The CRS will evaluate and declare Tech Spec 3.1.6.3

When sufficient reactivity manipulation has been observed, the scenario can continue.

Event #7/8: The Lead Examiner will cue the RC-P-1B trip immediately followed by the Reactor tripping and the "B" OTSG Tube leakrate rising to approximately 500 gpm. The CRS will enter OP-TM-EOP-001 and direct the Immediate Manual Actions and then continue in OP-TM-EOP-005, OTSG Tube Leak.

The URO will minimize SCM to lower pressure and therefore lower the OTSG tube leak rate. Guide 8 and OS-24 give direction to maintain SCM 30-70F, but as close to 30F as possible. The ARO will preferentially steam the "B" OTSG:

Upon receiving the elevated offsite dose projections, the CRS should invoke 10CFR 50.54x and raise the cooldown rate IAW OP-TM-EOP-005, Step 3.31.

Upon throttling HPI, the URO will recognize that MU-V-36, one of two Makeup Pump Recirculation path Valves (in series), will not open. The URO will maintain minimum Makeup/HPI flow via alternative methods IAW Rule 2 in order to avoid Makeup Pump damage.

The scenario can be terminated the "B" OTSG has been isolated and SCM has been minimized.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-7 – Minimize SCM - HPI must be throttled to minimize SCM while maintaining margin> 30°F this minimizes primary to secondary leakage and reduces dose on the secondary side of the plant as well as minimizing release to the public. If HPI is allowed to raise OTSG pressure above 1000 psig after OTSG is full, a liquid RCS release to atmosphere would occur. Task failure would be to not throttle and challenge this.

- Minimizing SCM outside of the following limits should be considered grounds for failure of the critical task:
  - Do not allow SCM to fall below 25F.
  - Do not allow SCM to rise above 70F sustained.

Safety Significance: Except when RCP NPSH limits are applicable and are more restrictive, RCS pressure should be maintained close to, but above, the minimum SCM to minimize RCS-SG ΔP. The reason for minimizing RCS-SG ΔP is to reduce the leak flowrate from primary to secondary to as low as possible. Therefore, this procedure (minimizing SCM) is desirable whenever possible during SGTR mitigation.
Reducing the leak flowrate from the RCS to the secondary side of a SG reduces RCS losses and when accomplished with an impaired steam system (e.g., weeping MSSV and MSL leak) should reduce integrated radiation releases from the impaired system. If the level of the leaking SG can be maintained within normal operating limits, then the SG will remain available for continued use during the cooldown, thus enhancing the transient mitigation capability of the plant.

Cues:
1. SCM monitor
2. SPDS displays and associated alarms
3. P-T display and associated alarms

Performance Indicators:
1. Operation of MU/HPI pump and valve controls
2. Operation of normal or auxiliary spray valve controls

Feedback:
1. SCM meter and/or plant SPDS and/or P-T display
2. RCS pressure and temperature
3. MU/HPI pump and valve status indications
4. Normal and auxiliary spray valve status indications

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-21 – Limit Uncontrolled Radiation Release – During SGTR mitigation:

- Attempt to control PZR level such that it does not continually decrease by increasing MU or HPI flow and reducing letdown flow
- If the reactor has not tripped, then perform controlled shutdown to prevent lifting MSSVs.
- Isolate non-essential steam loads from affected SG(s).
- If required to prevent exceeding [SG overfill setpoint] or [radiation limit], use emergency cooldown rate limit to 500'F.

The typical plant design allows for 40 cycles of an emergency cooldown to 500'F Thot at 240°F/hr. This rate is allowed for any SGTR event. However, it is recommended that the use of this emergency cooldown rate be limited to situations where:

a) the affected SG level(s) will reach the SG level limit before the SG can be isolated using the normal cooldown rate, including the use of SG drains if available, or

b) activity release rates are projected to reach the integrated limit before 500°F Thot at the normal cooldown rate.

The emergency cooldown rate is recommended for the two cases noted because several large SGTRs and/or a relatively high percentage of failed fuel already exist. In these cases, it is most important to prevent liquid discharge through the MSSVs and limit the duration of high activity release rates.

- Limiting Uncontrolled Radiation Release outside of the following limits should be considered grounds for failure of the critical task:
  - Do not allow affected OTSG MSSV's to lift.
  - Do not allow affected OTSG to go dry.

Safety Significance: If pressurizer level can be controlled, then the operator's ability to perform a controlled shutdown is greatly enhanced. Whenever possible power should be reduced as quickly as possible, but in a controlled manner, to well within the turbine bypass system capacity before tripping the reactor to prevent lifting of the MSSVs. This includes cases where maximum MU or HPI flow and letdown isolation are required to keep up with the tube leak and maintain pressurizer level. Power reduction is intended to minimize atmospheric radiation releases due to SG safety valve operation. Also, if a reactor trip can be averted through controlled operations, then ability to mitigate the transient is expected to be enhanced as normal transition from power operations to a controlled cooldown occurs.

Cues:

1. Main steam line radiation alarm
2. SG high level alarm
3. Pressurizer low level alarm
4. Verbal alert by plant staff that a SGTR is occurring and the reactor has not tripped

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-21 – Limit Uncontrolled Radiation Release (cont)

Performance Indicators:

1. Operation of MU/HPI pump controls
2. Operation of MU/HPI valve controls
3. Operation of letdown valve controls
4. Operation of TBV/ADV controls

Feedback:

1. Pressurizer level
2. Letdown flow
3. MU/HPI flow
4. RCS temperature
5. Verbal alert by plant staff of pressurizer level status
6. Verbal alert by plant staff of RCS cooldown rate

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-22 – Reduce Steaming/Isolate Affected SGs (includes use of SG drains) – Steam affected SGs to maintain level < [overfill setpoint]. If steaming alone cannot prevent SG fill, then use SG drains (if available) to maintain SG level below [overfill setpoint]. Isolate SG(s) if steaming and draining cannot prevent overfill and maintain RCS and isolated SG pressures < 1000 PSIG by use of [primary and secondary relief paths].

- Isolating Affected SGs outside of the following limits should be considered grounds for failure of the critical task:
    - Do not allow isolation to occur with RCS pressure > 1000 psig.

Safety Significance: The more probable tube rupture scenario is a tube leak in one SG with both SGs available. The preferred mitigation strategy is therefore isolation of the affected SG following the initial cooldown and depressurization to <1000 PSIG. This limits the radiological consequences of the event, but does require cooldown to DHRS operation using one SG.

Both SGs are always used in the initial cooldown and depressurization to < 1000 PSIG. Prevention of MSSV lift on the affected SG(s) is integral to the goal of minimizing off-site release, and assurance requires RCS temperatures at or below 500°F in order to maintain SCM when RCS pressure is < 1000 PSIG. Once this initial cooldown and RCS depressurization to <1000 PSIG is completed, then SG isolation can be considered.

There are limitations on continued steaming of a SG with a SGTR. These limitations consider the overriding concerns of SGTR transients that dictate the isolation of the SG(s) and initiation of HPI cooling, if necessary. These limits are based on integrated radiation dose reaching predetermined values and SG filling due to tube leakage despite steaming to achieve maximum allowable cooldown rate.

SGs isolated due to SG fill criteria pose concerns related to liquid passing through MSSVs. MSSVs should be prevented from passing liquid, since their failure to reseat becomes more probable. For this reason, RCS and SG pressures are maintained <1000 PSIG by use of [primary and secondary relief paths]. These relief paths may include such things as letdown, PZR vents, HPVs, the PORV, TBVs and ADVs.

Cues:

1. Rising OTSG level
2. Rad Monitor Alarms
3. Lowering Pressurizer level
4. Lowering RCS Pressure
5. Automatic initiation of HPI

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-22 – Reduce Steaming/Isolate Affected SGs (includes use of SG drains) (cont)

Performance Indicators:

1. Operation of TBV/ADV controls

Feedback:

1. SG(s) level and pressure
2. RCS pressure
3. MFW/EFW flow
4. MFW/EFW pump and valve status indication
5. TBV/ADV status indication

Industry Experience:

- TMI Reactor Trip (11/2/06) Main Steam Safety Valves remained open longer than expected. (IR 552591)
- Indian Point 2 (2/15/00) - Steam Generator Tube Failure (380 litres per minute)
- Palo Verde 2 (3/14/93) - Steam Generator Tube Leak ranged between 11 and 39 litres per day, suddenly turned to 900 litres per minute tube rupture.

PRA

- Steam Generator Tube Rupture (Initiating Event)

Event	Description	Procedure Support
	Initial Set-up.	100% Power, MOL
1	MSIV Inadvertent Closure	OP-TM-PPC-L2204
		1102-4, Power Operations
2	NR-P-1C Trips, NR-P-1B Fails to Auto-Start	OP-TM-MAP-B0105, 480V ES MOTOR TRIP
		OP-TM-MAP-B0205, 480V ES MOTOR OVERLOAD
		Tech Spec 3.3.2
3	Reactor Coolant Pump Seal Leakage	OP-TM-AOP-040, RCP 1 Seal Failure
		1102-4, Power Operations
		OP-TM-226-154, Shutdown RC-P-1D
4	Loss of Vital Bus D	OP-TM-AOP-018, Loss of VBD
		Tech Spec. 3.5.5.2
5	Total FW Demand Fails to Zero Volts, ICS Transient	OP-TM-AOP-070, Primary to Secondary Heat Transfer Upset
6	~30 gpm "B" OTSG Tube Leak (TS)	OP-TM-EOP-005, OTSG Tube Leak
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
		1102-4, Power Operations
7	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose	OP-TM-EOP-001, Reactor Trip
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
		OP-TM-EOP-005, OTSG Tube Leak
8	MU-V-36 Fails to Open	OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs OP-TM-211-901, Emergency Injection (HPI/LPI)

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-241	100% HFP ICS full AUTO	Equilibrium XENON
Remote MSR01	Value: 0 When: EVENT 1	MSIV Inadvertent Closure
TRIGGER 11	Value: DRF MSR01 When: RATPW<92	MSIV Inadvertent Closure
Malfunction RW02C	Value: INSERT When: EVENT 2	NR-P-1C Trips
Malfunction MU19D	Value: 20 When: EVENT 3	Reactor Coolant Pump Seal Leakage
Malfunction ED09D	Value: INSERT When: EVENT 4	Loss of Vital Bus D
Malfunction IC20	Value: INSERT When: EVENT 5	Total FW Demand Fails to Zero Volts
Malfunction TH17B	Value: 0.2 When: EVENT 6	"B" OTSG Tube Leak
Malfunction RC39A	Value: Insert When: EVENT 7	RC-P-1B trip
Malfunction RD29	Value: Insert When: EVENT 7	Reactor Trip
Malfunction TH16B	Value: 3.5 Delay 20 seconds When: EVENT 7	"B" OTSG Tube Rupture
Trigger 7	Value: DMF TH17B When: EVENT 7	Delete OTSG Tube Leak
Trigger 8	Value: Insert When: dhndhp1a > 0.9	MU-V-36 Fails to Open
Override 02A5S80-ZDISSMUV36(1)	Value: On When: Event 8	MU-V-36 Fails to Open
Remote MSR66	Value: Insert When: EVENT 12	Initiate Aux Boilers
Remote FWR80	Value: MAN When: EVENT 14	MS-V-13B Manual Control
Remote FWR81	Value: 0 When: EVENT 14	MS-V-13B Closed Position

Op Test No.: NRC	Scenario # 1	Event # 1			Page 15 of 53		
Event Description:	MSIV Inadvertent Closure						

Time	Position	Applicant's Actions or Behavior

Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 1.**
Indications Available:		**PPC-L2204 in alarm, MS-V-1A indicates closed on CC, "A" OTSG Pressure/Level rise.**
Booth Cue:		**If contacted as maintenance, inform the crew that "I see no damage to MS-V-1A and the valve may be reopened when Ops is ready to open it"**
	CRS	Direct entry into OP-TM-PPC-L2204, MAIN STEAM ISOL MS-V1A.
Examiner's Note:		**Step 4.1 is N/A.**
Procedure Note		The following steps are designed to prevent an overpressure condition that could challenge the RC-RV-2 (PORV) and to prevent operation in an unbalanced steam flow condition.
		OP-TM-PPC-L2204, MAIN STEAM ISOL MS-V1A
	CRS	Step 4.2: REDUCE reactor power to less than 90% power IAW 1102-4, "Power Operation".
Examiner's Note:		**The CRS will determine that the power reduction is a forced reduction, and will INITIATE Attachment 2A.**
		1102-4, Power Operation
	CRS	Step 3.3.2.A.1: PERFORM Enclosure 2A (for an emergency (forced) power reduction INITIATE Enclosure 2A).

Footnote: 1 – MS-V-1A: MAIN STEAM ISOL OF "A" OTSG "A" LINE

Op Test No.:	NRC	Scenario #	1	Event #	1	Page	16 of 53
Event Description:	MSIV Inadvertent Closure						

Time	Position	Applicant's Actions or Behavior
Examiner's Cue:		**Acknowledge as the personnel listed in the next step, or acknowledge as Shift Manager to notify the personnel listed in the next step. Also acknowledge Logging the notifications.**
	CRS	Step 3.3.2.A.2: If power change is greater than 10 MWe, then perform the following: a) NOTIFY the following: - Power Team - TSO - NDO b) LOG notifications to Power Team, TSO, and NDO in Control Room Log.
Procedure Note:		SO-3-3, H2 Flow Trouble, is an expected alarm. The cooling of main generator hydrogen during a power reduction causes hydrogen flow to exceed the alarm setpoint of 1000 SCF/D.
	ARO	Step 3.3.2.A.3.a: MAINTAIN Generator Reactive Load IAW OP-TM-301-472.
	URO	Step 3.3.2.A.3.b: If SG/REACTOR DEMAND is in AUTO, then REDUCE reactor power as follows: 1. ENSURE ULD is in HAND by observing White HAND light lit, red AUTO light not lit (CC).
Examiner's Note:		**The Load Rate of Change adjustment knob does not read in "%". If the CRS directs a 1%/Min load rate of change, the URO will dial the adjustment knob to 10. If the CRS directs a 3%/Min load rate of change, the URO will dial the adjustment knob to 30.**

Footnote: 1 – ULD: Unit Load Demand.

Op Test No.:	NRC	Scenario #	1	Event #	1	Page	17 of 53
Event Description:	MSIV Inadvertent Closure						

Time	Position	Applicant's Actions or Behavior
	URO	Step 3.3.2.A.3.b: If SG/REACTOR DEMAND is in AUTO, then REDUCE reactor power as follows: 2. SET ULD LOAD RATE OF CHANGE to ≤ 1 %/minute for PLANNED reductions or at a rate determined by CRS for Forced power reductions by changing the Load Rate of Change adjustment knob in the clockwise direction until the corresponding value is achieved.
Examiner's Note:		**The URO will decide MWe corresponding to the power level directed by the CRS by looking at the placard next to the ULD.**
	URO	Step 3.3.2.A.3.b: If SG/REACTOR DEMAND is in AUTO, then REDUCE reactor power as follows: 3. SET ULD Target Load Demand to desired setpoint by placing the ULD Control Station toggle switch in the down direction until the target MWe is targeted by the indicator.
Examiner's Note:		**Once Reactor Power is below 90%, the CRS will continue in OP-TM-PPC-L2204, MAIN STEAM ISOL MS-V1A.**
		OP-TM-PPC-L2204, MAIN STEAM ISOL MS-V1A
	ARO	Step 4.3 RE-OPEN MSIV as soon as possible by pressing the red open pushbutton and observing all three lights lit during travel, and only the red open light lit (green and white lights not lit) at the end of valve travel.
Examiner's Note:		**Once MS-V-1A is open, Go to Event 2.**

Footnotes: 1 – ULD: Unit Load Demand.
2 – MS-V-1A: MAIN STEAM ISOL OF "A" OTSG "A" LINE

Op Test No.:	NRC	Scenario #	1	Event #	2	Page	18 of 53
Event Description:	NR-P-1C Trips, NR-P-1B Fails to Auto-Start						

Time	Position	Applicant's Actions or Behavior
Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 2.**
Indications Available:		**MAP B-1-5 and B-2-5 in alarm, NR-P-1C amber disagreement light lit on CR, PPC alarm.**
Examiner's Note:		**Crew may decide to start NR-P-1B upon discovery of it not auto-starting IAW OS-24, Section 4.3.5.A:** **Any time an automatic control or interlock functions fails to perform as designed and there is no specific procedure direction, the reactor operator should take action to compensate directly for the failure. The Reactor Operator should verbalize the actions taken to inform the Control Room team of the condition and actions taken.**
Examiner's Note:		**The crew may choose to enter OP-TM-541-452, Remove NR-P-1C From Service, which provides direction to ES select NR-P-1B on the 1T 480V ES bus and also to close NR-V-1C.**
Booth Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to investigate NR-P-1C and its breaker, acknowledge the order. Nothing will be found at the pump or breaker.**
	CRS	Diagnose the trip of NR-P-1C and the failure of NR-P-1B to automatically start on standby and direct entry into OP-TM-MAP-B0105, 480V ES MOTOR TRIP
Examiner's Note:		**OP-TM-MAP-B0105, Step 1 is N/A**

Footnotes: 1 – NR-P-1C: Nuclear Services River Water Pump (usually "B" Train ES selected).
2 – NR-P-1B: Nuclear Services River Water Pump (usually not ES selected, "swing" pump).
3 – NR-V-1C: "C" Nuclear Services River Water Pump discharge valve.

Op Test No.:	NRC	Scenario #	1	Event #	2	Page	19 of 53
Event Description:	NR-P-1C Trips, NR-P-1B Fails to Auto-Start						

Time	Position	Applicant's Actions or Behavior
		OP-TM-MAP-B0105, 480V ES MOTOR TRIP
	ARO	Step 2: Starts NR-P-1B by turning the Control Switch (CR) clockwise, observing red indicating light and normal running amps after initial start.
Examiner's Note:		**The crew may match flags for NR-P-1C (place pump in Off or Pull-to-Lock to clear overhead alarm.**
Examiner's Note:		**OP-TM-MAP-B0105, Steps 3 and 4 are N/A**
	ARO	Step 5: Recognizes that Nuclear River header pressure is within the acceptable pressure band (OP-TM-541-461).
Examiner's Note:		**OP-TM-MAP-B0105, Step 6 is N/A**
Booth Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to ES select NR-P-1B on the 1T 480V ES bus, repeat the order but do not ES select the pump.**
	CRS	Step 7: Declares a 3.3.2 (72 Hour) Tech Spec clock.

Footnotes: 1 – NR-P-1C: Nuclear Services River Water Pump (usually "B" Train ES selected).

2 – NR-P-1B: Nuclear Services River Water Pump (usually not ES selected "swing" pump).

Op Test No.:	NRC	Scenario #	1	Event #	2	Page	20 of 53
Event Description:	NR-P-1C Trips, NR-P-1B Fails to Auto-Start						

Time	Position	Applicant's Actions or Behavior

Examiner's Note:	**T.S. 3.3.2 Maintenance or testing shall be allowed during reactor operation on any component(s) in the makeup and purification, decay heat, RB emergency cooling water, RB spray, BWST level instrumentation, or cooling water systems which will not remove more than one train of each system from service. Components shall not be removed from service so that the affected system train is inoperable for more than 72 consecutive hours. If the system is not restored to meet the requirements of Specification 3.3.1 within 72 hours, the reactor shall be placed in a HOT SHUTDOWN condition within six hours.***
Examiner's Note:	**Once the TS call is made, NR-P-1B is operating and sufficient time has been given for the direction to ES select NR-P-1B, Go to Event 3.**

Footnotes: 1 – NR-P-1B: Nuclear Services River Water Pump (usually not ES selected, "swing" pump).

Op Test No.: NRC	Scenario # 1	Event # 3		Page	21	of	53
Event Description:	Reactor Coolant Pump Seal Leakage						

Time	Position	Applicant's Actions or Behavior
Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 3.**
Indications Available:		**MAP Annunciator F-1-3 RCP SEAL #1 LEAK OFF FLOW HI/LO actuates, RC-P-1D Seal Leak Off flow indicates 6.2 gpm on the recorder on PC and on the computer.**
	URO	Diagnoses the failure of RC-P-1D #1 seal based on seal leak off flow indication.
	CRS	Determines the entry conditions for AOP-040 are met: - RC Pump #1 seal leakoff flow > 6 gpm on any RCP and thermal barrier cooling or seal injection is in service. Directs entry into OP-TM-AOP-040, RCP #1 Seal Failure
Examiner's Note:		**OP-TM-AOP-040, Step 1 is N/A.**
Procedure Note:		Seal injection flow can be adjusted with MU-V-32 in HAND or by adjusting H/A station setpoint.
		OP-TM-AOP-040, RCP #1 Seal Failure
	URO	Step 3.2: Maximizes seal injection flow <u>not</u> to exceed 60 gpm by placing the MU-V-32 Control Station in HAND (presses White HAND pushbutton and verifies white light lit, red light not lit) and then placing the toggle switch in the up direction until either 60 gpm seal injection is attained or MU-V-32 is 100% open. URO may also dial the H/A/ setpoint instead to achieve the same results.

Footnotes: 1 – RC-P-1D: "D" Reactor Coolant Pump
2 – MU-V-32: RCP Seal Injection Control Valve

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	22 of 53
Event Description:		Reactor Coolant Pump Seal Leakage					

Time	Position	Applicant's Actions or Behavior
Procedure Note:		Power reduction should be performed at a rate that supports RCP shutdown in less than 30 minutes.
	CRS	Step 3.3: INITIATE a power reduction using 1102-4 to within the appropriate limits (Reactor and MWe) based on shutdown of the RCP:
		1102-4, Power Operation
	CRS	Step 3.3.2.A.1: PERFORM Enclosure 2A (for an emergency (forced) power reduction INITIATE Enclosure 2A).
Examiner's Cue:		**Acknowledge as the personnel listed in the next step, or acknowledge as Shift Manager to notify the personnel listed in the next step. Also acknowledge logging the notifications.**
	CRS	Step 3.3.2.A.2: If power change is greater than 10 MWe, then perform the following: c) NOTIFY the following: - Power Team - TSO - NDO d) LOG notifications to Power Team, TSO, and NDO in Control Room Log.
Procedure Note:		SO-3-3, H2 Flow Trouble, is an expected alarm. The cooling of main generator hydrogen during a power reduction causes hydrogen flow to exceed the alarm setpoint of 1000 SCF/D.

Table for Step 3.3:

✓	# RCPs Left Running	Rx Power Limit (%)	MWe
	3	< 75	< 665
	1/loop	< 49	< 445
	0 in any loop	0	0

Op Test No.: NRC	Scenario # 1	Event # 3		Page	23	of	53
Event Description:	Reactor Coolant Pump Seal Leakage						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.3.2.A.3.a: MAINTAIN Generator Reactive Load IAW OP-TM-301-472.
	URO	Step 3.3.2.A.3.b: If SG/REACTOR DEMAND is in AUTO, then REDUCE reactor power as follows: 4. ENSURE ULD is in HAND by observing White HAND light lit, red AUTO light not lit (CC).
Examiner's Note:		**The Load Rate of Change adjustment knob does not read in %. If the CRS directs a 1%/Min load rate of change, the URO will dial the adjustment knob to 10. If the CRS directs a 3%/Min load rate of change, the URO will dial the adjustment knob to 30.**
	URO	Step 3.3.2.A.3.b: If SG/REACTOR DEMAND is in AUTO, then REDUCE reactor power as follows: 5. SET ULD LOAD RATE OF CHANGE to ≤ 1 %/minute for PLANNED reductions or at a rate determined by CRS for Forced power reductions by changing the Load Rate of Change adjustment knob in the clockwise direction until the corresponding value is achieved.
Examiner's Note:		**The URO will decide MWe corresponding to the power level directed by the CRS by looking at the placard next to the ULD.**
	URO	Step 3.3.2.A.3.b: If SG/REACTOR DEMAND is in AUTO, then REDUCE reactor power as follows: 6. SET ULD Target Load Demand to desired setpoint by placing the ULD Control Station toggle switch in the down direction until the target MWe is targeted by the indicator.
Examiner's Note:		**Once Reactor Power is below 75%, the CRS will continue in OP-TM-AOP-040, RCP 1 Seal Failure.**

Footnote: 1 – ULD: Unit Load Demand.

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	24 of 53
Event Description:	Reactor Coolant Pump Seal Leakage						

Time	Position	Applicant's Actions or Behavior
		OP-TM-AOP-040, RCP #1 Seal Failure
	CRS	Step 3.4: When power (Reactor and Turbine) is within limits to support RCP shutdown, then perform the following to shutdown the affected RCP: - OP-TM-226-154 (D RCP)
Procedure Note:		A 2/1 RCP combination with OTSG levels > LLLs will require a re-ratio (70% / 30%) of Feedwater flow to A / B OTSG.
		OP-TM-226-154, Shutdown RC-P-1D
	CRS	Step 4.2: Recognizes that Reactor power is > 20%, and determines the expected FW Flow requirements for new RCP combination to minimize effects on Delta Tc.
Examiner's Note:		**If asked, time is not available for Electrical Maintenance to monitor RC-P-1D vibrations.**
	ARO	Step 4.4: Starts RC-P-2D-1, Oil Lift Pump AC HP or RC-P-2D-2, Oil Lift Pump DC HP by placing one of the control switches clockwise and verifying red running light lit, green secured light not lit, and red indicating flag displayed (CC).
	ARO	Step 4.4: Starts RC-P-3D-1, Backstop Oil Pump #1 or RC-P-3D-2, Backstop Oil Pump #2 by placing one of the control switches clockwise and verifying red running light lit, green secured light not lit, and red indicating flag displayed (CC).

Footnotes: 1 – RC-P-1D: "D" Reactor Coolant Pump
2 – RC-P-2D-1: RC-P-1D AC High Pressure Oil Lift Pump
3 – RC-P-2D-2: RC-P-1D DC High Pressure Oil Lift Pump
4 – RC-P-3D-1: RC-P-1D AC Backstop Oil Pump #1
5 – RC-P-3D-1: RC-P-1D AC Backstop Oil Pump #2
6 – LLL: Low Level Limits

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	25	of	53
Event Description:		Reactor Coolant Pump Seal Leakage							

Time	Position	Applicant's Actions or Behavior
	URO	Step 4.5: Places RC-P-1D in Pull-To-Lock by rotating the Control Switch counter-clockwise while pulling away from the console, ensuring no lights lit, black indicating flag is displayed, and the handle is locked in the extended position.
Procedure Note:		Vibration levels at a low value with the absence of change indicates 0 rpm.
	Crew	Step 4.6: Verify the following: - RC-P-1D not rotating backwards. - Vibration readings (PLF) indicate RC-P-1D has reached 0 rpm.
	URO	Step 4.7: Place the following in Pull-To-Lock: - RC-P-3D-1, Backstop Oil Pump #1 by rotating the Control Switch counter-clockwise while pulling away from the console, ensuring black indicating flag is displayed, and the handle is locked in the extended position. - RC-P-3D-2, Backstop Oil Pump #2 by rotating the Control Switch counter-clockwise while pulling away from the console, ensuring black indicating flag is displayed, and the handle is locked in the extended position.

Footnotes: 1 – RC-P-1D: "D" Reactor Coolant Pump
2 – RC-P-2D-1: RC-P-1D AC High Pressure Oil Lift Pump
3 – RC-P-2D-2: RC-P-1D DC High Pressure Oil Lift Pump

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	26 of 53
Event Description:	Reactor Coolant Pump Seal Leakage						

Time	Position	Applicant's Actions or Behavior
	URO	Step 4.8: Place the following in Pull-To-Lock: - RC-P-2D-1, Oil Lift Pump AC HP by rotating the Control Switch counter-clockwise while pulling away from the console, ensuring black indicating flag is displayed, and the handle is locked in the extended position. - RC-P-2D-2, Oil Lift Pump DC HP by rotating the Control Switch counter-clockwise while pulling away from the console, ensuring black indicating flag is displayed, and the handle is locked in the extended position.
		OP-TM-AOP-040, RCP #1 Seal Failure
	URO	Step 3.5: When affected RCP stops rotating, then promptly close the following for the affected RCP by pressing the close pushbutton and verifying the green closed light is lit and the red open light is not lit:

✓	RCP	Valve to Close
	A	MU-V-33A
	B	MU-V-33B
	C	MU-V-33C
	D	MU-V-33D

Examiner's Note: **Once MU-V-33D is Closed, Go to Event 4.**

Footnotes: 1 – RC-P-3D-1: RC-P-1D AC Backstop Oil Pump #1
2 – RC-P-3D-1: RC-P-1D AC Backstop Oil Pump #2
3 – MU-V-33A: RC-P-1A Seal #1 Leakoff Isolation Valve
4 – MU-V-33B: RC-P-1B Seal #1 Leakoff Isolation Valve
5 – MU-V-33C: RC-P-1C Seal #1 Leakoff Isolation Valve
6 – MU-V-33D: RC-P-1D Seal #1 Leakoff Isolation Valve

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	27	of 53
Event Description:		Loss of Vital Bus D						

Time	Position	Applicant's Actions or Behavior
Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 4.**
Examiner's Note:		**Attachment 1 of OP-TM-AOP-018, Loss of VBD, listing the effects of a loss of VBD, is listed on page 54 of this SEG.**
Indications Available:		**Multiple Main Annunciator Panel Alarms illuminated, "D" RPS Cabinet deenergized, 1 of 2 Control Rod Position Indication Panels deenergized, 1 Row of HSPS lights lit.**
	Crew	Diagnosis a loss of Vital Bus "D".
	CRS	Direct entry into OP-TM-AOP-018, Loss of VBD.
		OP-TM-AOP-018, Loss of VBD
	ARO	Step 3.1: Announces entry into OP-TM-AOP-018, "Loss of VBD," over the plant page and radio.
Examiner's Note:		**OP-TM-AOP-018, Steps 3.2-3.5 are N/A. If asked, as Shift Manager, state "there are no fuel movements in progress".**
Procedure Note:		Loss of power to RM-A-1G trips AH-E-17A/B, AH-E-20A/B, AH-E-21, AH-E-26, AH-E-93A/B, AH-E-94A/B & AH-E-95A/B, closes AH-D-28 and AH-D-617.

Footnotes: 1 – RM-A-1G: Control Tower Air-In Gas, Radiation Monitor.
2 – AH-E-17A/B: A/B Control Building Normal Supply Fans.
3 – AH-E-20A/B: A/B CB and Fuel Handling Building 1st Floor Exhaust Fans
4 – AH-E-21: Control Building Kitchen Exhaust Fan.
5 – AH-E-26: Machine Shop and Chemical Hoods Supply Fan.
6 – AH-E-93A/B, AH-E-94A/B: A/B CB Hallway Supply/Exhaust Fans.
7 – AH-E-95A/B: A/B CB 2nd Floor Booster Fans.
8 – AH-D-28/AH-D-617: CB 1st Floor Isolation Damper/Backup Damper.

Op Test No.: NRC	Scenario #	1	Event #	4	Page	28	of 53
Event Description:	Loss of Vital Bus D						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.6: Places RM-A-1G interlock switches in the DEFEAT position by turning the interlock defeat switch to the defeat position and verifying that Main Annunciator C-2-1 is in alarm.
	ARO	Step 3.7: Restores Control Tower ventilation IAW 1104-19, "Control Building Ventilation System."
Examiner's Note:		**1104-19 has no direct section to recover from an RMS interlock. Section 3.7.2 is scripted below. Validators also used Section 3.4 which had the same steps in order as scripted below.**
		1104-19, Control Building Ventilation System
	ARO	Step 3.7.2.2.1: Makes a Plant Page Announcement ATTENTION Plant Personnel, Starting Control Building Ventilation, use caution when opening or closing Control Building doors due to the potential for high differential pressures to exist.
	ARO	Step 3.7.2.2.2: Verifies that fire alarms are clear for Control Tower and Air Intake Tunnel (AIT) on Heating and Ventilation Panels H&V A/B and PL A/B.
Examiner's Note:		**The ARO may secure AH-E-19A to imitate an initial lineup. This is not required however.**
	ARO	Step 3.7.2.2.3: Verifies AH-E-19A is running by observing the red light lit and green light not lit.
Examiner's Note:		**The ventilation fan controls are set up such that they must be held in the Start position longer than other Control switches. This is normal and expected.**

Footnotes: 1 – RM-A-1G: Control Tower Air-In Gas, Radiation Monitor.
2 – AH-E-19A: A CB Return Air Fan.

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	29	of	53
Event Description:		Loss of Vital Bus D							

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.7.2.2.4: Starts AH-E-17A by turning the Control Switch in the clockwise direction, and observing the red light lit and green light not lit.
Procedure Note:		Expect HVA-4-5 to come in and HVA-3-8 to come in and clear.
	ARO	Step 3.7.2.2.5: Verifies AH-E-95A has automatically started by observing the red light lit and green light not lit.
Examiner's Note:		**The next step is a Two-hand operation.**
	ARO	Step 3.7.2.2.6/7: Presses "AH-D-28/617 RESET PB" on H&V PANEL and holds it in while Starting AH-E-20A by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit. Releases "AH-D-28/617 RESET PB" on H&V PANEL when AH-D-28/617 are OPEN as indicated by ESAS indication on PCR or white open light on H&V Panel.
Procedure Note:		Expect HVA-6-5 and HVA-4-5 to come in and clear.
	ARO	Step 3.7.2.2.8: Verifies AH-E-93A/94A selected for operation at H&V PANEL by switch position pointing to AH-E-93A/94A.

Footnotes: 1 – AH-E-17A: A Control Building Normal Supply Fan.
2 – AH-E-20A: A CB and Fuel Handling Building 1st Floor Exhaust Fan.
3 – AH-E-93A: A CB Hallway Supply Fan.
4 – AH-E-94A: A CB Hallway Exhaust Fan.
5 – AH-E-95A: A CB 2nd Floor Booster Fan.
6 – AH-D-28/AH-D-617: CB 1st Floor Isolation Damper/Backup Damper.

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	30 of 53
Event Description:	Loss of Vital Bus D						

Time	Position	Applicant's Actions or Behavior
Booth Cue:		**If directed as an Auxiliary Operator to:** **1. START AH-E-21, then, after a pause, report back that "AH-E-21 is running".** **2. SECURE AH-E-90 and 91 fans from FH Bldg. 305 OR to report the status of AH-E-90 and AH-E-91, then after a pause, report back that "AH-E-90 and 91 are secured".** **3. START AH-E-26, then, after a pause, report back that "AH-E-26 is running".**
Examiner's Note:		**The following steps are not required for the scenario to continue but are scripted to give the CRS time to make the Tech Spec call.**
		OP-TM-AOP-018, Loss of VBD
Procedure Note:		Loss of power fails AH-D-30A-G and AH-D-31A-G closed, resulting in loss of ventilation to Control Building 322' Battery Rooms, Inverter Rooms, ES 480V Switchgear Rooms, and Remote Shutdown Area.
	CRS	Step 3.8: Initiates OP-TM-AOP-034, "Loss of Control Building Cooling."
	ARO	Step 3.9: Select the desired groups (1-4 or 5-7) on CRD-FPM-A (left side PI Panel).

Footnotes: 1 – AH-D-30A-G: A/B Battery Charger Room Inlet Dampers.
2 – AH-D-31A-G: A/B Battery Charger Room Outlet Dampers.
3 – AH-E-21: Control Building Kitchen Exhaust Fan.
4 – AH-E-90: Primary Sample Hood Recirc/Exhaust Fan.
5 – AH-E-91: Control Building 1st Floor Recirc Fan.
6 – AH-E-26: Machine Shop and Chemical Hoods Supply Fan.

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	31 of 53
Event Description:	Loss of Vital Bus D						

Time	Position	Applicant's Actions or Behavior
Procedure Note:		Loss of power to RM-A-6G will trip AH-E-11. Loss of power to RM-A-4G and RM-G-9 will trip AH-E-10 and close dampers AH-D-120, AH-D-121, and AH-D-122.
	ARO	Step 3.10: Places the following radiation monitor interlock switches in the DEFEAT position (PCR): • RM-A-4G • RM-A-6G • RM-G-9
	ARO	Step 3.11: Restores Auxiliary Building and Fuel Handling Building ventilation IAW 1104-15A, "Auxiliary and Fuel Handling Building Supply and Exhaust System."
		1104-15A, Auxiliary and Fuel Handling Building Supply and Exhaust System
	ARO	Step 3.3.2.1/2: Verifies AH-E-14B/D are running by observing the red lights lit and green lights not lit (H&V Panel).
	ARO	Step 3.4.2.1.A.1: Ensures open FH BLDG Isolation Dampers, AH-D-120,121,122 (H&V Panel), by turning the Control Switch clockwise and verifying the red light is lit, green light not lit.
	ARO	Step 3.4.2.1.A.2: Starts AH-E-10 by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit.

Footnotes: 1 – RM-A-4G: Fuel Handling Building Exhaust Air - Gas, Area Radiation Monitor.

2 – RM-A-6G: Auxiliary Building Exhaust Air - Gas, Area Radiation Monitor.

3 – RM-G-9: Spent Fuel Bridge Radiation Monitor.

4 – AH-E-10: Fuel Handling Building Supply Fan.

5 – AH-E-11: Auxiliary Building Supply Fan.

6 – AH-D-120, AH-D-121, and AH-D-122: Fuel Handling Building 348 Elevation Supply Dampers.

7 – AH-E-14B/D: B/D Aux Building / Fuel Handling Building Exhaust Fans.

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	32	of	53
Event Description:	Loss of Vital Bus D								

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.4.2.1.B: Starts AH-E-11 by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit. Observes flows trending upward on AH-FR-149, 150, and 151 (H&V Panel)
Booth Cue:		**If directed to select instruments in HSPS Cabinet IAW AOP-018 Step 3.12, then INSERT EVENT #12, then report the instruments as selected.**
		OP-TM-AOP-018, Loss of VBD
	CRS	Step 3.13: Directs an Auxiliary Operator to select the following instruments in HSPS Cabinet Section A2 Rack 4 for EF-V-30B and EF-V-30D control: • LT-1042 • LT-1040 • LT-1050 • LT-1048
	CRS	Declares a 3.5.5.2 (7 Day) Tech Spec clock, based on RM-G-26 or RM-G-22.

Footnotes: 1 – AH-FR-149: Fuel Handling Building Exhaust Flow Recorder.
2 – AH-FR-150: Auxiliary Building Exhaust Air Flow Recorder.
3 – AH-FR-151: Aux Bldg/Fuel Handling Bldg Total Exhaust Flow Recorder.
4 – AH-E-11: Auxiliary Building Supply Fan.
5 – EF-V-30B: EFW Control Valve to "B" OTSG.
6 – EF-V-30D: EFW Control Valve to "A" OTSG.
7 – RM-G-22: High Range Containment Area Monitor.
8 – RM-G-26: "A" OTSG Turbine Bypass Line Radiation Monitor.
9 – LT-1040: "A" OTSG Operating Range Level Transmitter.
10 – LT-1042: "A" OTSG Startup Range Level Transmitter.
11 – LT-1048: "B" OTSG Operating Range Level Transmitter.
12 – LT-1050: "B" OTSG Startup Range Level Transmitter.

Op Test No.:	NRC	Scenario #	1	Event #	4	Page	33	of 53
Event Description:		Loss of Vital Bus D						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**T.S. 3.5.5.2: The channels identified for the instruments specified in Table 3.5-3 shall be OPERABLE. With the number of instrumentation channels less than required, restore the inoperable channel(s) to OPERABLE in accordance with the action specified in Table 3.5-3.** **Table 3.5-3, Action A: With the number of OPERABLE channels less than required by the Minimum Channels OPERABLE requirements:** **1. either restore the inoperable channel(s) to OPERABLE status within 7 days of the event, or** **2. prepare and submit a Special Report within 30 days following the event outlining action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status.**
Examiner's Note:		**A 72 hour Tech Spec (3.5.1.9) does exist if the alternate instruments are not selected for HSPS.**
Examiner's Note:		**A Tech Spec does exist for PORV Position Monitors, also a 7 day clock, but can be exited by closing the PORV Block Valve.**
Examiner's Note:		**Once Control Building ventilation has been restored and the Tech Spec call made, Go to Event 5.**

Footnote: 1 – PORV: Pressurizer Pilot Operated Relief Valve.

Op Test No.:	NRC	Scenario #	1	Event #	5	Page	34	of 53
Event Description:	Total FW Demand Fails to Zero Volts, ICS Transient							

Time	Position	Applicant's Actions or Behavior
Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 5**
Indications Available:		**RCS Pressure transient, RCS Temperature transient, Reactor Power lowers rapidly and continuously, Multiple Annunciators in alarm.**
	Crew	Diagnoses the Total FW Demand Failure and/or the severe ICS transient.
	CRS	DIRECTS entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	URO	Step 2.1 (**IMA**): Places the Diamond Station in Manual by pressing the Manual/Auto pushbutton on the Diamond Panel, observing the Manual light is lit and the Auto light is not lit (CC).
	URO/ARO	Step 2.2 (**IMA**): Places SG "A" FW Demand and SG "B" FW Demand ICS Stations in HAND by pressing the HAND pushbuttons on each ICS Station, verifying the white HAND lights are lit and the red AUTO lights are not lit on each (CC).
	ARO	Step 2.3 (**IMA**): Verifies Turbine Header Pressure is between 835 and 935 psig as read on the Turbine Header Pressure digital indication (CL).
	URO	Step 2.4 (**IMA**): Verifies RCS Pressure is lowering and/or less than 2205 PSIG by observing RCS pressure meters (CC/PC). If RCS Pressure is >2205 psig, URO places RC-V-1 control in Manual (CC), opens RC-V-1 fully by pressing the open pushbutton and observing the red open light lit and the green closed light not lit, then places RC-V-1 control back to AUTO.

Footnote: 1 – RC-V-1: Pressurizer Spray Control Valve.

Op Test No.:	NRC	Scenario #	1	Event #	5	Page	35 of 53
Event Description:	Total FW Demand Fails to Zero Volts, ICS Transient						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**OP-TM-AOP-070, steps 3.1 and 3.2 are IAAT's that should not be applicable during this Event.**
	CRS	Step 3.3: Verifies the Main Turbine is reset by observing it on-line (CL).
	CRS	Step 3.4: Assigns manual control responsibilities and control bands as follows:
	URO	INSERT or WITHDRAW rods to maintain Reactor power within 1% of current power level by operating the Control Rod switch on the Diamond Panel as applicable (CC).
	ARO	Adjust FW Flow to maintain Tavg within 2°F of current temperature by adjusting SG A and SG B FW Demand Station toggle switches as applicable (CC). Maintain Turbine Hdr Pressure within 10 psig of current pressure by adjusting Turbine Load Set Station demand as applicable (CC).
Examiner's Note:		**OP-TM-AOP-070, step 3.5 is N/A.**
	URO/ARO	Step 3.6: Ensures SG/Reactor Demand, Reactor Demand, and SG A/B Load Ratio Demand Stations are in HAND by pressing each HAND pushbutton and observing white HAND lights are lit and red AUTO lights are not lit for each station. Observes that the ULD ICS Station is already in HAND by the white HAND light being lit.
	CRS	Step 3.7: Verifies that MFW Pumps are controlling FW Valve dP greater than 30 psid (CL) and that Reactor Power is greater than 75% (CC).
Examiner's Note:		**OP-TM-AOP-070, step 3.8 is N/A and 3.9 has already been verified.**

Op Test No.:	NRC	Scenario #	1	Event #	5	Page	36 of 53
Event Description:	Total FW Demand Fails to Zero Volts, ICS Transient						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.10 and 3.11: Maintains RCS pressure between 2105 and 2205 psig, controls RCS Tavg 578 to 580 °F, and controls RCS ΔTc < 5° F by adjusting SG "A" and SG "B" FW Demand Station toggle switches as applicable.
Examiner's Note:		**OP-TM-AOP-070, steps 3.12 and 3.13 are N/A.**
Examiner's Note:		**Once AOP-070 Actions are complete, and the plant is stable, Go to Event 6.**

Op Test No.:	NRC	Scenario #	1	Event #	6	Page	37 of 53
Event Description:	~30 gpm "B" OTSG Tube Leak						

Time	Position	Applicant's Actions or Behavior
Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 6.**
Indications Available:		**MAP Annunciator C-1-1 actuates, RM-A-5/15/RM-G-27 counts rise.**
	Crew	Diagnoses the "B" OTSG Tube leak.
	CRS	Announces entry into OP-TM-EOP-005, OTSG Tube leakage
		OP-TM-EOP-005, OTSG Tube leakage
	CRS	Step 3.1: NOTIFY "Shift Dose Assessor" to begin offsite dose assessment.
	ARO	Step 3.2: Announce OTSG TUBE LEAK.
	INFO	Step 3.3: INITIATE Guide 9, "RCS Inventory Control.
		OP-TM-EOP-010, GUIDE 9, RCS Inventory Control
	URO	Step C.1: Verify MU Pump is operating.
	URO	Step C.2: Verify MU-V-5 is closed.
	URO	Step C.3: Verify MU24-FI >20 gpm RNO: Ensure MU-V-18 is Open by pressing the Open Pushbutton (CC), verifying the valve open light is lit and the valve closed light is not lit.

Footnotes: 1 – RM-A-5/15: Main Condenser Offgas Radiation Monitors.
2 – RM-G-27: "B" OTSG Turbine Bypass Line Radiation Monitor.
3 – MU-V-5: Letdown Flow Control Bypass Valve.
4 – MU-V-18: Normal Makeup Reactor Building Isolation Valve.

Op Test No.: NRC	Scenario # 1	Event # 6			Page 38 of 53		
Event Description:	~30 gpm "B" OTSG Tube Leak						

Time	Position	Applicant's Actions or Behavior
	URO	Step C.4: Ensure MU-V-17 is open.
	URO	Step C.5: Verify Pressurizer level is being restored.
		OP-TM-EOP-005, OTSG Tube leakage
Booth Cue:		**When directed to fire both Auxiliary Boilers, insert Event #13.**
	ARO	Step 3.4: INITIATE the following procedures to start both Auxiliary Boilers: - OP-TM-414-401, "Starting AS-B-1A". - OP-TM-414-402, "Starting AS-B-1B".
	CRS	Step 3.5: VERIFY the reactor is critical.
	N/A	Step 3.6: IAAT pressurizer level < 150 inches and reactor power > 25%, then perform the following: 1. INITIATE HPI. 2. TRIP the reactor. 3. GO TO EOP-001
	N/A	Step 3.7: IAAT the turbine trips, and reactor power > 15%, then perform the following: 1. TRIP the reactor 2. GO TO EOP-001
Procedure Note:		1102-4, "Power Operation" actions to perform plant power reduction should be completed as resources permit. The rate of power reduction should be selected to maintain control and avoid lifting MSSVs.

Footnotes: 1 – MU-V-17: Normal Makeup to RCS Control Valve.
2 – AS-B-1A: "A" Auxiliary Boiler.
3 – AS-B-1B: "B" Auxiliary Boiler.

Op Test No.:	NRC	Scenario #	1	Event #	6	Page	39 of 53
Event Description:	~30 gpm "B" OTSG Tube Leak						

Time	Position	Applicant's Actions or Behavior
	URO	Step 3.8: **RNO:** REDUCE power at a rate within manual control limitations IAW OP-TM-621-471 "ICS Manual Operations".
Examiner's Note:		**The following step may have been performed previously and therefore is a condition met.**
	N/A	Step 3.9: PLACE both FW-P-1A and FW-P-1B in HAND IAW the following procedures: - OP-TM-401-472, "Manual Control of FW-P-1A" by pressing the white "Hand" pushbutton (CC), verifying that the white "Hand" light is lit and the red "Auto" light goes out. - OP-TM-401-473, "Manual Control of FW-P-1B" by pressing the white "Hand" pushbutton (CC), verifying that the white "Hand" light is lit and the red "Auto" light goes out.
Examiner's Note:		**The following step is a manual reactivity manipulation.**
		OP-TM-621-471, ICS Manual Operations
	URO	Step 4.2.4: If necessary to maintain reactor power or control rods within limits or if a power change is being conducted IAW 1102-4, then ADJUST SG/REACTOR DEMAND as follows: 1. If maintaining stable reactor power or a slow planned power change, then RAISE or LOWER in discrete steps to keep neutron error between +2% and –2%. 2. If rapid power reduction is required, then LOWER as necessary to achieve desired reactor power level and ENSURE FW flow controlled within limits by lowering and/or raising on the SG/REACTOR DEMAND toggle switch (CC) as necessary.

Footnotes: 1 – FW-P-1A: "A" Main Feedwater Pump.
2 – FW-P-1B: "B" Main Feedwater Pump.
3 – ULD: Unit Load Demand.

Op Test No.:	NRC	Scenario #	1	Event #	6	Page	40 of 53
Event Description:	~30 gpm "B" OTSG Tube Leak						

Time	Position	Applicant's Actions or Behavior
Examiner's Cue:		**Acknowledge as the personnel listed in the next step, or acknowledge as Shift Manager to notify the personnel listed in the next step. Also acknowledge to evaluate EAL's.**
		OP-TM-EOP-005, OTSG Tube leakage
	CRS	Step 3.10: REQUEST SM to: - Evaluate Emergency Action Levels - NOTIFY Power Team - NOTIFY TSO - NOTIFY NDO.
	CRS	Step 3.11: IDENTIFY the affected OTSG:
Booth Cue:		**When directed to place the MS-V-13B handwheel in the closed position, insert Event #14 and then report the action complete.**
	ARO	Step 3.12: IAAT all of the following conditions exist: - The affected OTSG is identified - EF-P-1 is not running - Either Motor Driven EFW Pump is Operable then Place the Handwheel of the affected MS-V-13, in the CLOSED position.
	CRS	Declares a 3.1.6.2 and 3.1.6.3 (24 hours) Tech Spec clock.
Examiner's Note:		**Technical Specification 3.1.6.2: If unidentified reactor coolant leakage (excluding normal evaporative losses) exceeds one gpm or if any reactor coolant leakage is evaluated as unsafe, the reactor shall be placed in hot shutdown within 24 hours of detection.**
Examiner's Note:		**After the Tech Spec call is made and sufficient reactivity manipulation has occurred, GO TO Event 7.**

Footnote: 1 – MS-V-13B: Main Steam Supply to EF-P-1 from "B" OTSG.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	41 of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open						

Time	Position	Applicant's Actions or Behavior
Booth Instructions:		**When directed by the Lead Examiner INITIATE Event 7.**
Indications Available:		**RC-P-1B Green light lit, All Control Rod bottom lights, various annunciators, Pressurizer level lowering, RCS Pressure lowering, "B" OTSG level rising**
Examiner's Note:		**The CRS will direct the IMAs of OP-TM-EOP-001, Reactor Trip and following the Symptom Check he should re-enter OP-TM-EOP-005, OTSG Tube Leakage. Based on the reactor being tripped, previous actions have already been taken and the event picks up at step 3.24. The crew may or may not have made it through step 3.23, but those steps are not applicable once the reactor is tripped.** **The URO will continue in Guide 9, RCS Inventory (This Page).**
	Crew	Diagnoses RC-P-1B trip and the Reactor trip.
		OP-TM-EOP-001, REACTOR TRIP
	URO	Step 2.1 (IMA): Presses Both Reactor Trip and DSS pushbuttons (CC).
	URO	Step 2.2 (IMA): Verifies that the reactor is shutdown by <u>one</u> of the following: • Power Range Nuclear Instrumentation indicates less than 5% (CC) • All control rods are inserted (PC) • Source Range count rate is continuously lowering (CC)
	URO	Step 2.3 (IMA): Presses the Turbine Trip pushbutton (CL)
	URO	Step 2.4 (IMA): Verifies the Turbine Stop valves are closed by observing the indication on CL.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	42	of	53

Event Description: RC-P-1B Trip, Reactor Trip, ~500 gpm “B” OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open

Time	Position	Applicant's Actions or Behavior
	ARO	Performs a Symptom Check, and identifies the “B” OTSG tube leak, and informs the CRS.
	URO	Diagnoses the “B” OTSG Tube leak rate increasing by lowering Pressurizer level and RCS pressure, and informs the CRS.
		OP-TM-EOP-010, GUIDE 9, RCS Inventory Control
	URO	Step C.5: Verify Pressurizer Level is being restored. **RNO:** Throttle MU-V-217 by pressing the open pushbutton (CC), verifying valve open light is lit and valve closed light not lit.
	URO	Step C.6: Verify MU24-FI > 20gpm
	URO	Step C.7: Verify Pressurizer Level is being restored. **RNO:** Close MU-V-3 by pressing the close pushbutton (CC), verifying valve closed light is lit and valve open light not lit.
	URO	Step C.8: Verify Pressurizer Level is being restored. **RNO:** INITIATE HPI IAW OP-TM-211-901, "Emergency Injection HPI/LPI" by pressing manual ES pushbuttons (CC and CR)

Footnotes: 1 – MU-V-217: High Capacity Normal Makeup Valve.
2 – MU24-FI: Normal Makeup Flow Indicator.
3 – MU-V-3: RCS Letdown Reactor Building Isolation Valve.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	43 of 53

Event Description: RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-005, OTSG Tube Leakage.
	URO	Step 3.24: Verify control rod groups 1 through 7 are fully inserted.
Examiner's Note:		**Step 3.25 has already been performed. The CRS should continue in OP-TM-EOP-005. This event picks up at step 3.29. The crew may or may not have made it through step 3.28. Those steps are listed in the previous events**
	ARO	Step 3.26: Ensure announcement of reactor trip.
	ARO	Step 3.27: Dispatch an operator to check MSSV status.
	ARO	Step 3.28: Ensure performance of an alarm review.
	ARO	Step 3.29: IAAT OTSG A (B) pressure approaches, or is greater than 1000 psig, then perform the following: - ENSURE MS-V-2A (MS-V-2B) is Open. - OPEN MS-V-3D, E, F (MS-V-3A, B, C) to maintain OTSG pressure < 1000 psig.
Examiner's Note:		**Cooldown rate is 100°F/hr per Guide 11 until 10CFR 50.54x is invoked.**
CT-21	ARO	Step 3.30: IAAT OTSG level is rising due to tube leakage in an AVAILABLE OTSG, then preferentially STEAM to maintain OTSG level < 85% by adjusting the toggle switches for MS-V-3A/B/C upward/downward as necessary.

Footnotes: 1 – MS-V-2A: "A" OTSG Isolation Valve to EF-P-1, TBV's, and ADV.
2 – MS-V-2B: "B" OTSG Isolation Valve to EF-P-1, TBV's, and ADV.
3 – MS-V-3A/B/C: Turbine Bypass Valves from the "B" OTSG.
4 – MS-V-3D/E/F: Turbine Bypass Valves from the "A" OTSG.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	44 of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open						

Time	Position	Applicant's Actions or Behavior
Procedure Note:		If exceeding RCS or Pressurizer Tech Spec cooldown rate limits is needed to permit isolation of an OTSG, then 10CFR 50.54x entry should be evaluated.
Examiner's Note:		**Step 3.31 is N/A at this time.**
	URO	Step 3.32: IAAT all of the following exist: - RCS pressure < 1750 psig, - SCM > 25 °F, - RCS pressure is being controlled, then BYPASS 1600 psig ESAS IAW 1105-3 by pressing the appropriate bypass/defeat pushbuttons (CC and CR) and verifying that the appropriate bypass/defeat lights are lit.
	INFO	Step 3.33: MINIMIZE SCM IAW Guide 8, "RCS Pressure Control".
Examiner's Note:		**The upper band for minimizing Subcooling Margin is found is OS-24, Conduct of Operations During Abnormal and Emergency Events, Section 3.9:** **An intentional reduction of RCS pressure, to minimize SCM, when SCM is > 70 degF. Actions to minimize SCM are described in Guide 8.**

Footnotes: 1 – RC-V-2: PORV Isolation Valve.
2 – PORV: Pressurizer Pilot Operated Relief Valve.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	45	of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open							

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-010 Guide 8, RCS Pressure Control
	INFO	IAAT REACTOR is SHUTDOWN and SCM > 25 °F, and pressurizer has a steam bubble, then CONTROL RCS pressure as follows: 1. MAINTAIN RCS pressure within the limits of Figure 1 and 1A 2. If it is required to MINIMIZE SCM, then LOWER RCS pressure IAW Section B. Steps should be performed sequentially until RCS Press is lowering at the desired rate. Pressure may be lowered until one of the following limits is approached: – MAINTAIN SCM > 30°F, – If an RCP is ON, then MAINTAIN RCS pressure above RCP NPSH limits (1102-11 Fig 1 and 1A, or OP-TM-226-000), – If all RCPs are OFF and OTSG TUBE LEAKAGE does not exist, then MAINTAIN pressure above "Head bubble" limit (Fig 1 and 1A).
Examiner's Note:		**HPI Throttling IAW Rule 2 is described on the next page.**
	INFO	Step B.1: ENSURE HPI/LPI is throttled per Rule 2
Examiner's Note:		**Guide 8 Step B.2 has already been performed and Step B.3 is not expected to occur.**
	URO	Step B.4: Ensure Pressurizer heaters are off by rotating the Control Switches for all heater banks to the OFF position (CR).

Op Test No.: NRC	Scenario # 1	Event # 7/8			Page 46 of 53		

Event Description: RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open

Time	Position	Applicant's Actions or Behavior
CT-7	URO	Step B.5/6: Perform the following: A. Verify an RCP is on by red running light, red indicator flag, and amps. B. Ensure RC-V-3 is open by red open light lit, green closed light not lit. C. Throttle open RC-V-1 by placing the Auto-Manual Control switch in Manual and then pressing down on the Open pushbutton until the desired throttle position. Tweaks in the other direction may be required. When the desired pressure and/or SCM is achieved, close RC-V-1 by pressing the closed pushbutton until the closed light is lit and the open light is not lit or by placing the Control Switch in the Auto position and then verifying the lights indicate closed.
Examiner's Note:		**OP-TM-EOP-010, RULE 2, Steps A.1 through A.3 conditions are met.**
		OP-TM-EOP-010, RULE 2, HPI THROTTLING
	URO	Step A.4: Determines that SCM > 25F and HPI COOLING is not required, and throttles HPI IAW OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI).
		OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI)
	URO	Att. 7.3, Step 1: Defeats ESAS signals by pressing the defeat pushbuttons (manual and/or automatic signals as required).
Examiner's Note:		**Step 2 condition is met.**

Footnotes: 1 – RC-V-3: Pressurizer Spray Line Isolation Valve.
2 – RC-V-1: Pressurizer Spray Control Valve.

Op Test No.: NRC	Scenario # 1	Event # 7/8	Page 47 of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open		

Time	Position	Applicant's Actions or Behavior
	URO	Att. 7.3, Step 3/4: WAAT HPI throttling is permitted IAW RULE 2 and prior to reducing any MU pump flow to less than 115 GPM, then perform the following: • Obtains CRS concurrence to throttle HPI. • Determines that DH-V-7A and DH-V-7B are closed, and opens MU-V-37 by pressing the open pushbutton and observing the open light lit and the closed light not lit (CC). • Determines that MU-V-36 will not open by observing the open light not lit and the closed light lit (CC) and maintains MU Pump flow greater than 115 GPM.
Examiner's Note:		**OP-TM-211-901, Step 5 will be performed, but is not the priority. Guide 9 is initiated already, so the step is met, but it is important to move on and terminate HPI to avoid lifting the PORV.**
	URO	Att. 7.3, Step 7: Closes two MU-V-16 valves to establish flow through one valve on each train and retain HPI flow through four RCS nozzles (e.g., MU-V-16A and MU-V-16D) by pressing the closed pushbutton for two MU-V-16 valves and verifying that the closed light is lit and the open light is not lit for each of the two valves.
	URO	Att. 7.3, Step 8: Throttle open the MU-V-16 opposite of MU and SI (MU-V-16C or MU-V-16D) by pressing the close, open, and stop pushbuttons as necessary to provide adequate HPI makeup flow.

Footnotes: 1 – DH-V-7A: "A" Decay Heat Cooler Outlet to MU Pump Suction Valve.
2 – DH-V-7B: "B" Decay Heat Cooler Outlet to MU Pump Suction Valve.
3 – MU-V-36: MU-P-1A/B/C Recirc Isolation Valve.
4 – MU-V-37: MU-P-1A/B/C Recirc Isolation Valve.
5 – PORV: Pressurizer Pilot Operated Relief Valve.
6 – MU-V-16A: "A" HPI Control Valve.
7 – MU-V-16C: "C" HPI Control Valve.
8 – MU-V-16D: "D" HPI Control Valve.

Op Test No.: NRC	Scenario # 1	Event # 7/8	Page 48 of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open		

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**The following steps to throttle HPI will only be performed if HPI flow is still excessive and is not required prior to scenario termination.**
	URO	Att. 7.3, Step 9: If two MU pumps are operating, then when flow is reduced to one MU-V-16: 2. If two MU pumps are operating, then SHUTDOWN the ES selected pump and PLACE Control Switch in Normal-After-Stop (MU-P-1C) by rotating the Control Switch counter-clockwise, observing that the green indicator flag is visible, the green off light is lit, the red running light is not lit, and amps are zero (CR)
Examiner's Note:		**Step 10 is N/A.**
	URO	Att. 7.3, Step 11: THROTTLE MU-V-16 parallel to MU and SI (MU-V-16A or MU-V-16B) by pressing the close, open, and stop pushbuttons as necessary to provide adequate HPI makeup flow.
Examiner's Cue:		**Role play as Shift Manager, as requested, and give permission to open MU-V-18.**
	URO	Att. 7.3, Step 12: Upon obtaining Shift Manager concurrence, determines that OP-TM-244-901 requirements are met and opens MU-V-18 by pressing the open pushbutton and observing the open light lit and the closed light not lit (CC).

Footnotes: 1 – MU-P-1C: "C" Makeup Pump.
2 – MU-V-16A: "A" HPI Control Valve.
3 – MU-V-16B: "B" HPI Control Valve.
4 – MU-V-18: Normal Makeup Reactor Building Isolation Valve.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	49	of	53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open								

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-005, OTSG Tube Leakage.
	N/A	Step 3.34: IAAT OTSG level > 85% Operate Range, then perform the following: ___ 1. When RCS pressure < 1000 psig, then INITIATE Attachment 1A or 1B to isolate the OTSG. ___ 2. If both OTSGs are being isolated, then GO TO EOP-009 ___ 3. When affected OTSG's TBVs and ADVs are closed, then PERFORM Guide 12 "RCS Stabilization".
	Crew	Step 3.35: IAAT both OTSGs are available, and projected or actual offsite integrated dose approaches 500 mRem TEDE or 1500 mRem CDE (thy), then perform the following: 1. When RCS pressure < 1000 psig, then INITIATE Attachment 1A or 1B to isolate the most affected OTSG. 2. When the affected OTSG TBVs and ADVs are closed, then PERFORM Guide 12 "RCS Stabilization".
Booth Cue:		**When Subcooling Margin has been minimized and when directed by the Lead Examiner, call in as the shift dose assessor and report that "projected Off-Site Integrated Dose is 1.6R thyroid".**
Examiner's Note:		**Step 3.31 is an IAAT step that now has conditions met. Once RCS pressure is less than 1000 psig, Attachment 1B will be entered.**
Procedure Note:		If exceeding RCS or Pressurizer Tech Spec cooldown rate limits is needed to permit isolation of an OTSG, then 10CFR 50.54x entry should be evaluated.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	50	of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open							

Time	Position	Applicant's Actions or Behavior
	Crew	Step 3.31: IAAT OTSG isolation criteria may be challenged prior to reducing RCS pressure < 1000 psig, then perform the following: 1. INITIATE RCS cooldown to 500°F at a rate within RCS inventory control capability and < 240 °F/hr. 2. ENSURE RC-V-2 is Open. 3. CYCLE the PORV to reduce SCM to approximately 30°F.
		OP-TM-EOP-005, ATTACHMENT 1B, OTSG B Isolation
CT-22	ARO	Ensure Closed the following valves (Control Room): - MS-V-1C by pressing the close pushbutton, verifying that the green closed light is lit, and the red open and white test lights are not lit (CC).
	ARO	- MS-V-1D by pressing the close pushbutton, verifying that the green closed light is lit, and the red open and white test lights are not lit (CC).
	ARO	- FW-V-17B by placing the ICS Control Station to HAND by pressing the white HAND pushbutton, verifying white HAND light lit, red AUTO light not lit, then ensuring that the valve is closed by moving the toggle switch in the down direction until closed is indicated (if necessary) (CC).
	ARO	- FW-V-5B by ensuring the green closed light is lit and the red open light is not lit (CC).

Footnotes: 1 – MS-V-1C: Main Steam Isolation Valve of "B" OTSG "C" Line.
2 – MS-V-1D: Main Steam Isolation Valve of "B" OTSG "D" Line.
3 – FW-V-17B: "B" Main Feedwater Control Valve.
4 – FW-V-5B: "B" Main Feedwater Block Valve.

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	51	of	53

Event Description: RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open

Time	Position	Applicant's Actions or Behavior
	ARO	- FW-V-16B by placing the ICS Control Station to HAND by pressing the white HAND pushbutton, verifying white HAND light lit, red AUTO light not lit, then ensuring that the valve is closed by moving the toggle switch in the down direction until closed is indicated (if necessary) (CC).
	ARO	- FW-V-92B by ensuring the green closed light is lit and the red open light is not lit (CC).
CT-22		
	ARO	Ensure Closed the following valves (Control Room): - EF-V-30B by placing the Control Station in Manual by pressing the Manual pushbutton and ensuring that Manual is lit and Auto is not lit, then by locking the dial tab in the full left position (CC).
	ARO	- EF-V-30C by placing the Control Station in Manual by pressing the Manual pushbutton and ensuring that Manual is lit and Auto is not lit, then by locking the dial tab in the full left position (CC).

Footnotes: 1 – FW-V-16B: "B" Feedwater Startup Control Valve.
2 – FW-V-92B: "B" OTSG Startup Feedwater Block Valve.
3 – EF-V-30B: EFW Control Valve to "B" OTSG.
4 – EF-V-30C: EFW Control Valve to "B" OTSG.

Op Test No.: NRC	Scenario # 1	Event # 7/8	Page 52 of 53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open		

Time	Position	Applicant's Actions or Behavior
CT-22	ARO	- MS-V-3A, MS-V-3B, MS-V-3C, and MS-V-4B by placing the ICS Control Station to HAND by pressing the white HAND pushbutton, verifying white HAND light lit, red AUTO light not lit, then ensuring that the valve is closed by moving the toggle switch in the down direction until closed is indicated (if necessary) (CC).
	ARO	- Verifying that MS-V-13B and CA-V-4B or CA-V-5B are already closed by the green closed light lit and red open light not lit (CC and PCR).
Examiner's Note:	**Scenario can be terminated when HPI has been throttled, SCM has been minimized, and the "B" OTSG has been isolated.**	

Follow-up question: What was the highest event entered during scenario?

FA1 - OTSG Tube Rupture requiring ESAS Actuation

Footnotes: 1 – MS-V-3A/B/C: Turbine Bypass Valves from the "B" OTSG.
2 – MS-V-4B: Atmospheric Dump Valve for the "B" OTSG.
3 – MS-V-13B: Main Steam Supply Valve to EF-P-1 from "B" OTSG.
4 – CA-V-4B: "B" OTSG Feedwater Sample Valve.
5 – CA-V-4B: "B" OTSG Feedwater Sample Isolation Valve

Op Test No.:	NRC	Scenario #	1	Event #	7/8	Page	53	of	53
Event Description:	RC-P-1B Trip, Reactor Trip, ~500 gpm "B" OTSG Tube Rupture with an elevated offsite dose, MU-V-36 fails to open								

Time	Position	Applicant's Actions or Behavior

OP-TM-AOP-018
ATTACHMENT 1
EFFECTS OF LOSS OF VBD

Page 1 of 1

One channel of CRD Trip Confirm will de-energize to its actuate state but the other channel remains operable. Turbine will not trip and FW-V-5A/B will not close.
"D" RPS channel de-energizes. CRD-CB-1D open. "D" RPS channel trip signal is sent to all other RPS cabinets. (TS Table 3.5-1)
RCPPM-1D&2D de-energize. RC-P-1D tripped signal is sent to RPS Channels A, B, and C, and HSPS EFW Initiation Train A & Train B.
ES Relay Cabinet 3B de-energizes: 1 channel tripped in all ES actuations, B train only.
HSPS Channel IV de-energizes. HSPS Channel IV tripped signal sent to HSPS Trains A & B.
Multiple SASS transfers occur due to loss of HSPS Channel IV instruments.
Annunciator SER B de-energizes. MAP annunciator power remains on VBC. Annunciator Panel PL transfers to backup power from TRA. All Annunciators on PRF and PRF1 fail.
Loss of power to RM-L-6 will close WDL-V-257.
Loss of power to RM-A-6G will trip AH-E-11.
Loss of power to RM-A-4G will trip AH-E-10 and close dampers AH-D-120, AH-D-121, and AH-D-122.
Loss of power to RM-A-7G will close WDG-V-47.
Loss of power to RM-A-1G trips AH-E-17A/B, AH-E-20A/B, AH-E-21, AH-E-26, AH-E-93A/B, AH-E-94A/B & AH-E-95A/B, closes AH-D-28 and AH-D-617.
Loss of power to RM-G-9 Trips AH-E-10 and closes AH-D-120, AH-D-121, and AH-D-122.
AH-D-30A-G and AH-D-31A-G fail closed, resulting in loss of ventilation to A&B Battery Rooms, A&B Inverter Rooms, 1P & 1S 480V ES Switchgear Rooms, and Remote Shutdown Area.
Control room radio on Computer Console, P.E.M.A radio, and Scanner will be inoperable. Control room radio on CRS desk will remain operable.

Scenario Event Description
NRC Scenario 2

Facility:	Three Mile Island	Scenario No.: 2	Op Test No.: 12-01 NRC
Examiners:		Operators:	
Initial Conditions:	• (Temporary IC-242)		
	• 100% Power, MOL		
	• SBO OOS For Maintenance, expected to return to service in 10 hours		
	• Crane work is occurring on the West side of the Plant to stage new piping.		
	• NRC Authorization Code for today is AB12.		
Turnover:	Maintain 100% Power Operations		
Critical Tasks:	• Isolate Possible RCS Leak Paths (CT-3)		
	• Natural Circulation RCS Flow (CT-12)		
	• Turbine Trip (CT-18)		

Event No.	Malf. No.	Event Type*	Event Description
1	DHR32	TS CRS	BWST level lowers, entry into OP-TM-MAP-E0204
2	MS19A	C CRS C ARO	Isolable Steam Leak in Turbine Bldg, entry into OP-TM-AOP-051. (ARO: Isolate Steam Leak)
3	IC23	I CRS I URO I ARO	SG/RX Demand Station fails to 0 Volts, Entry into OP-TM-AOP-070 (URO/ARO: Coordinate to stabilize plant in ICS HAND control)
4	TU01D	N CRS R URO N ARO	High Vibrations on Main Turbine, entry into OP-TM-MAP-K0201 and 1102-4. (URO/ARO: Power reduction with ICS in Manual)
5	ZDIPB1 RCA	TS CRS I URO I ARO	Inadvertent 1600# ESAS Signal, entry into OP-TM-AOP-046. (URO:Immediate Manual Actions, ARO: Restores Letdown)
6	ED05D	TS CRS C ARO	Loss of 1D 4Kv Bus, entry into OP-TM-AOP-013. (ARO: Places LO-P-6 in PTL)
7	EG04A EG04B	I CRS I URO	Loss of Stator Coolant Pumps, Main Turbine fails to automatically runback and trip (URO: Trip Reactor, ARO: Adjust Main Feedwater)
8	ED01	M CRS M URO M ARO	Loss of Offsite Power, entry into OP-TM-AOP-020.
9	EG07A	C CRS C URO	EG-Y-1B Trips, Station Blackout (URO: Isolates Cooling paths to RCP's)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRCScenario #2

Event #1: When the crew has accepted the watch, the Lead Examiner will cue the lowering level of the BWST due to a crane piercing the tank at the 53.5 ft level.

The crew will diagnose the low level in the BWST by lowering level on the BWST level indicators (CC and CR) and annunciator E-3-4 in alarm. Although it initially drops rapidly, the crew will identify it as steady at approximately 54.5 ft. The CRS will review and declare the following Tech Spec: 3.3.1.1.a:

3.3.1.1 Injection Systems

a. The borated water storage tank (BWST) shall contain a minimum of 350,000 gallons of water having a minimum concentration of 2,500 ppm boron at a temperature not less than 40°F. If the boron concentration or water temperature is not within limits, restore the BWST to OPERABLE within 8 hrs. If the BWST volume is not within limits, restore the BWST to OPERABLE within one hour. Specification 3.0.1 applies.

Once the Tech Spec has been declared, the scenario can continue.

Event #2: The Lead Examiner will cue the Isolable Steam Leak in the Turbine Building.

The operators will diagnose a Secondary Side Steam Leak based on a lowered efficiency of the Secondary Plant (Megawatts, Header Pressure, OTSG pressures, etc.)

Upon a Steam Leak in the Turbine Building, the following Critical Safety Functions are affected:

CSF 1, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. A secondary side steam leak will bypass steam away from the Turbine. If the steam leak is large enough, electrical generation will lower. ICS will raise reactor power to raise MWe back up to ICS demanded MW. If the steam leak causes Tave to lower, ICS will also try to raise reactor power to recover Tave.

CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. A Steam Leak may affect power to non-safety related equipment in the Turbine Building.

CSF 9, Fire Protection and Remote Shutdown Capability: Maintain means to prevent detect and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. A Steam Leak may cause fire alarms to actuate. This could be the first indication of a Steam Leak to the Control Room. May cause sprinkler systems to actuate or fire dampers to close.

The crew will diagnose the Steam Leak and the CRS will enter OP-TM-AOP-051, Secondary Side High Energy Leak. OP-TM-AOP-051 is entered for Steam Leaks that affect large portions of the plant and therefore it is not obvious to the operator what needs to be done initially to isolate the leak.

The affected Building is determined and from there, OP-TM-AOP-051 systematically attempts to isolate the leak remotely from the Control Room while taking steps to minimize the adverse effects of a steam environment on safety related equipment. The OP-TM-AOP-051 mitigation strategy for a Steam Leak in the Turbine Building is as follows:

- Attempt to isolate the leak from the Control Room.
- Shutdown and Cooldown the plant in a controlled manner to minimize pressure surges that could make the leak worse. Shutdown may have to be done quickly or the plant may have to be tripped depending on the circumstances.

The ARO will isolate Steam Leak by closing the appropriate valve, MS-V-5B. This can be performed because the steam supplies to the Main Feedwater Pumps are as follows:

- Below 25% power, Main Steam, only, supplies the Main Feedwater Pumps.
- Between 25% and 40% power, Main Steam supplements Extraction Steam as supplies to the Main Feedwater Pumps.
- Above 40% power, Extraction Steam, only, supplies the Main Feedwater Pumps.

Once the Steam Leak has been isolated, the scenario can continue.

Event #3: The Lead Examiner will cue the failure of the SG/RX Demand Station to Zero Volts. This will cause an ICS transient, which if not responded to swiftly, will cause a Reactor Trip.

The crew will diagnose the ICS failure by a rapid change in RCS pressure, Reactor Power rising, multiple annunciator alarms, and/or changes in indications at multiple ICS stations. Entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET will be required based on RCS pressure not being controlled in ICS AUTO.

"RCS pressure is not being controlled" requires the operator to make a subjective determination, based on their skills, training, and experience. A determination that RCS pressure is being controlled should include the following elements: 1) The reason for the transient is understood 2) RCS pressure response is consistent with the expected response for the event 3) Automatic or manual control in accordance with normal operating procedures is effectively controlling RCS pressure. A conservative assessment (i.e. concluding that RCS pressure is not being controlled) is appropriate when the three conditions above cannot be satisfied. ICS failures are one class of events that can lead to an upset in primary to secondary heat transfer. Most ICS failures can be mitigated by use of the appropriate manual control normal operating procedures.

This entry into AOP-070 is unique from the other scenarios because Reactor Power will lower while RCS pressure rises. The URO will have to place the Diamond Panel in manual to control Reactor Power or RPS will trip the reactor on high RCS pressure.

Once the plant is stabilized in ICS HAND control, the scenario can continue.

Event #4: The Lead Examiner will cue the High Vibrations on Main Turbine.

The crew will diagnose the High Vibrations on Main Turbine by Annunciator K-2-1 in alarm, and multiple PPC points in alarm. The crew will commence a power reduction to < 45% with ICS in manual in order to trip the Main Turbine. This is the reactivity manipulation for the scenario.

Once sufficient reactivity manipulation has occurred, the scenario can continue.

Event #5: The Lead Examiner will cue the Inadvertent 1600# ESAS Signal. The crew must quickly recognize the condition and perform the required Immediate Manual Actions to minimize the RCS pressure transient and pressurizer in-surge due to HPI. Additionally, while at power, immediately reducing HPI also minimizes the possibility of a reactor trip on high RCS pressure. The following Critical Safety Functions are affected by an inadvertent ESAS signal:

CSF 1, Reactivity & Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. **HPI Actuation** will insert negative reactivity as borated water from the BWST will be injected into the RCS. ICS will pull control rods to maintain ULD demand and RCS Tave. Potential all rods out condition. As primary side power decreases, ICS cross limits will lower feedwater flow in an attempt to match primary to secondary heat removal.

CSF 2, Reactor Vessel Inventory Control: Provide the means to maintain the core covered with sub cooled water. **HPI Actuation** will isolate RCS letdown and normal makeup. HPI will cause pressurizer level to rise. MU tank level will lower (MUT level/pressure requirements). BWST level will lower (BWST TS level).

CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure to prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. **HPI Actuation** will cause RCS pressure to rise. Seal Injection is not affected by an ES actuation. AOP-046 has the operator secure the remaining MU pump if the MU-V-16s cannot be closed from the control room. This action immediately terminates HPI and seal injection. The thermal barrier heat exchangers provide adequate seal cooling when the SI is secured. AOP-046 ensures adequate thermal barrier cooling prior to terminating seal injection. Once MU-V-36 and 37 are opened locally and the appropriate MU-V-16s are closed, a makeup pump is restarted and SI is re-established.

CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times. **HPI Actuation** will inject cold BWST into the RCS. The RCS will also cool due to the negative reactivity insertion from the injected BWST water lowering core power.

CSF 5, Containment Integrity: Provide means to prevent or minimize fission product release to the environment. (1) Maintain containment pressure below design and (2) Provide capability to isolate the containment when required. An inadvertent **HPI Actuation** will start the Reactor River system, and the RB cooling fans will be running in slow speed. Normal cooling to the RB cooling fans will be isolated. RB Temperature and pressure will lower due to the actuation of the RR system. The degree of temperature reduction would depend of river temperature. Building Spray System valves will open to align the BWST to the RB, but the BS pumps would not start unless a 30# signal is present. Closure of the containment isolation valves under the HPI signal would not adversely affect their associated systems.

CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. An inadvertent **HPI Actuation** will start the emergency diesel generators unloaded.

CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling & ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. An inadvertent **HPI Actuation** will start support systems to support ECCS and RB cooling systems. The DC and DR pumps will start to support MUP and DHP cooling which would be running during an inadvertent actuation. ES selected NS and NR pumps will start. Two NR and NS pumps are normally running. There is a potential for three NS pumps running which would start an overcooling of the NS system.

CSF 9, Fire Protection & Remote Shutdown Capability: Maintain means to prevent, detect, and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. An inadvertent **HPI Actuation** would trip FS-P-2.

The crew will diagnose the Inadvertent “A” 1600# ESAS Signal by multiple annunciators in alarm, “A” Train components in their ES actuated state, and/or “A” EDG running, while all primary indications appear steady or rising (RCS pressure not at 500#).

The URO will perform the Immediate Manual Actions of OP-TM-AOP-046, INADVERTANT ESAS. The ARO will restore letdown IAW OP-TM-211-950 (performing the appropriate portion of the procedure when restoring from isolation following an ESAS signal).

Once the plant is stabilized and Letdown is restored, the scenario can continue.

Event #6: The Lead Examiner will cue the Loss of the 1D 4Kv Bus.

Upon a Loss of the 1D 4Kv Bus, the following Critical Safety Functions are affected:

CSF 1, Reactivity & Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. A loss of the 1D 4Kv bus will not affect reactor shutdown capability. Emergency boration must be performed using “B” Train as MU-V-14A, MU Pump Suction Valve from BWST, will be unavailable.

CSF 2, Reactor Vessel Inventory Control: Provide the means to maintain the core covered with sub cooled water. A loss of 1D 4Kv bus will cause Train A Emergency Core Cooling Systems (HPI and LPI) to be inoperable. Train B is unaffected.

CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure to prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. A loss of 1D 4Kv bus will cause RC-V-1, Pressurizer Spray Valve, and the Emergency power to Pressurizer Group 8 Heaters to be unavailable.

CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times. A loss of the 1D 4Kv bus will cause EF-P-2A and DHR Train A to be inoperable. EF-P-2B, EF-P-1, and DHR Train B are available.

CSF 5, Containment Integrity: Provide means to prevent or minimize fission product release to the environment. (1) Maintain containment pressure below design and (2) Provide capability to isolate the containment when required. A loss of 1D 4Kv bus causes Reactor Building Emergency Cooling Train A and Building Spray Train A to be unavailable. Train B is available as well as Normal Reactor Building Cooling.

CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. A loss of the 1D 4Kv bus due to a bus fault will prevent use of the Emergency Diesel Generators. Prolonged loss of AC increases the risk of a Loss of DC and Vital busses.

CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling & ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. A loss of the 1D 4Kv bus will cause Train A of all emergency cooling support systems (Control Building cooling, Nuclear Services Closed Cooling Water cooling, Intermediate Closed Cooling water cooling, River Water Systems, Equipment ventilation, etc.) to be unavailable. Train B is unaffected.

CSF 9, Fire Protection & Remote Shutdown Capability: Maintain means to prevent, detect, and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. A loss of the 1D 4Kv bus will cause the Relay Room Cardox and Screen House detection systems to be inoperable. Fire watches will be initiated.

The operators will diagnose a Loss of the 1D 4Kv Bus based on a loss of running equipment powered from the 1D 4Kv bus (Secondary Closed Cooling Water Pumps, Secondary River Water Pumps, Intermediate Closed Cooling Water Pumps, etc.), LO-P-6 starting, and half of the Control Room lighting out.

The CRS will enter OP-TM-AOP-013, LOSS OF 1D 4160V BUS. The ARO will place the Control Switch for LO-P-6 to Pull-To-Lock to minimize loading on the Battery. The CRS will evaluate and declare Tech Spec 3.7.2.f:

- T.S. 3.7.2 – The reactor shall not remain critical unless all of the following requirements are satisfied:
  - 3.7.2.f – The Engineered Safeguards bus, switchgear, load shedding, and automatic diesel start systems shall be operable except as provided in Specification 3.7.2.c above and as required for testing.

Once LO-P-6 is in Pull-To-Lock and the Tech Spec has been declared, then the scenario can continue.

Event #7: The lead examiner will cue the Loss of Stator Coolant Pumps, causing a lack of Main Generator Stator Cooling.

The crew will diagnose a Loss of Stator Cooling Pumps by Main Annunciators L-2-7, GEN STATOR STBY CLG PUMP RUN, and Main Annunciator L-1-7, GEN STATOR CLG LOSS RUNBACK, in alarm, and no operating Stator Coolant Pump indications on PCL.

The crew will enter OP-TM-MAP-L0107 and OP-TM-MAP-L0207. The ARO will attempt to start the standby pump from PCL and will identify that it will not start. The crew will identify that the Turbine Control Valves are not closing as expected and, if the condition continues for more than 3.5 minutes, that the Main Turbine did not automatically trip.

- IAW OP-TM-MAP-L0107:
  - Automatic Actions:
    - Turbine Control Valves close at 23.4% vmo/min.
    - Turbine trips after 2 minute time delay should turbine not runback to approximately 95% power.
    - Turbine trips after 3.5 minute time delay should turbine not runback to approximately 29.6% power.

The CRS will enter OP-TM-EOP-001, Reactor Trip. The URO will trip the reactor (CT-18). The Main Turbine will fail to automatically trip and the URO will trip it manually. The ARO will adjust Main Feedwater flow to avoid an overcooling event.

Once the Reactor and Main Turbine have been tripped and a symptom check has been performed, then the scenario can continue.

Event #8: The lead examiner will cue the Loss of Offsite Power.

The crew will diagnose a Loss of Offsite Power by the Control Room lighting going dark for 10 seconds, followed by half of the lights returning once the B Emergency Diesel Generator powers the 1E 4Kv bus, as well as several alarms indicating a loss of the 4 bus and 8 bus, and a loss of seal injection and letdown. The CRS will direct entry into OP-TM-AOP-020, Loss of Station Power.

OP-TM-AOP-020 addresses two types of Loss of Station Power events. (1) Loss of Offsite Power with one or both diesels supplying the ES 4160V busses and (2) a loss of offsite power with no diesels supplying the ES 4160V busses.

- If one or both diesels are supplying the ES busses, the procedure walks the operators through ensuring RCS cooling and RCP seal cooling is established. As long as one diesel is available, the reactor can be stabilized and the operators can methodically walk through powering additional busses and starting additional equipment.

The ARO will establish Natural Circulation by feeding the OTSG's IAW Rule 4 (CT-12) and verify that Natural Circulation exists IAW Guide 10, Natural Circulation.

- IAW Guide 10:
    - Natural Circulation exists when the following conditions exist:
        - RCS differential temperature develops and stabilizes <50F.
        - Thot < 600F.
        - Incore temperatures stabilize and track Thot indications.
        - Tcold reflects OTSG saturation temperature for the existing OTSG pressure.
        - Primary to Secondary heat transfer is demonstrated by steaming or feeding OTSGs.
        - Adequate SCM exists.

Once Natural Circulation has been established, then the scenario can continue.

Event #9: The lead examiner will cue the Loss of EG-Y-1B.

The crew will diagnose a Loss of Offsite Power by the Control Room lighting going dark as well as several alarms indicating a loss of EG-Y-1B. The CRS will direct entry into OP-TM-AOP-020, Loss of Station Power, Section 4.0, Station Blackout.

OP-TM-AOP-020 addresses two types of Loss of Station Power events. (1) Loss of Offsite Power with one or both diesels supplying the ES 4160V busses and (2) a loss of offsite power with no diesels supplying the ES 4160V busses.

- In a Station Blackout (no power to either 4160V ES bus), immediate attempts are made to energize the ES busses. Actions are taken to prevent inventory loss, including protecting the RCP seals. The operators take action to minimize DC loads to maximize station battery life.

The URO will place Intermediate Closed Cooling Water Pumps in Pull-To-Lock and ensure that RCP Seal Return and Seal Injection Valves are closed (CT-3).

The scenario can be terminated when the Main Turbine has been tripped, Natural Circulation has been established, Intermediate Closed Cooling Water Pumps have been placed in Pull-To-Lock, and RCP Seal Return and Seal Injection lines have been isolated.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-3 - Isolate Possible RCS Leak Paths – All isolable leaks should be isolated, if possible. There are several possible leaks in the RCS which may be isolated by closing certain valves. These may include:

- PORV and PORV Block Valve.
- Pressurizer Spray Valve and Spray Block Valve
- Pressurizer Vent Valves.
- Pressurizer Sample Valves.
- Hot Leg High Point Vent Valves.
- Reactor Vessel Head Vent Valves.

Station Blackout procedures include provisions for minimizing primary inventory losses, including:

- Isolating all Letdown flows.
- Closing Seal Return Valves.
- Isolating other known leak paths.

Protecting against RCP Seal LOCA outside of the following limits should be considered **grounds for failure of the critical task**:

- Isolating Seal Return Lines while any Reactor Coolant Pump #1 seal inlet temperature > 235°F.
- Isolating Intermediate Closed Cooling Water System while any Reactor Coolant Pump #1 seal inlet temperature > 235°F.

Safety Significance: Elevated RCP seal temperatures will result in increased seal leakage of approximately 21 gpm / pump. To avoid seal damage and excessive seal leakage, do **not** restore RCP seal injection.
To avoid water hammer, thermal barrier cooler damage, and RCS leakage to the ICCW system, do **not** restore RCP thermal barrier cooling.
Either Seal Injection restoration or Intermediate Closed Cooling Water restoration would lead to a reduction of RCS inventory.

Cues:
1. Computer indication for RCP #1 Seal Inlet Temperature

Performance Indicators:
1. Operation of associated RCP Seal Valve controls.
2. Operation of associated RCP Seal Pump controls.

Feedback:
1. Indications of Valve status indications associated with RCP Seals.
2. Indications of Pump status indications associated with RCP Seals.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-12 – Establish Natural Circulation RC Flow – Whenever forced RC flow is not available, NC flow should be established. Maintaining primary to secondary heat transfer via NC eliminates the need to add RC to the RB as would occur with the back up feed and bleed HPI core cooling mode.

- If primary to secondary heat transfer has been lost, then establish and maintain appropriate SG levels in accordance with Rule 4.0.
- Reduce SG pressure using the TBVs/ADVs to establish a positive primary to secondary side ΔT of - 50°F.
- RCS pressure should be maintained constant or slightly increasing using MU or HPI. RCS pressure should not be increased if PTS guidance is invoked.

Trying to establish Natural Circulation RC flow outside of the following limits should be considered **grounds for failure of the critical task**:

- Establish Emergency Feedwater flow IAW Rule 4 to each OTSG (less than 515 gpm total), with a target band of 50-85% in the Operating Range.
- Establish Natural Circulation prior to transitioning into OP-TM-EOP-009, HPI Cooling.

Safety Significance: Enhances the transient mitigation capability of the plant by maintaining SGs operable and eliminates the need to add RC to the RB as with HPI Cooling.

Cues:
- Low RC flow alarm
- Verbal alert by plant staff that all RCPs have tripped
- SCM monitor and associated alarms
- P-T display and associated alarms

Performance Indicators:
- Operation of EFW/FW pump and valve controls
- Operation of TBV/ADV controls
- Operation of MU/HPI pump and valve controls

Feedback:
- Verbal verification that natural circulation has been established
- SG pressure
- RC temperature

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-18 – Turbine Trip - Whenever conditions exist such that a reactor trip is required, then the normally redundant actions of tripping the reactor and main turbine should be accomplished immediately. Tripping the main turbine provides assurance of a redundant trip signal to the main turbine electro-hydraulic control unit.

Due to Excessive Heat Transfer concerns, tripping the Main Turbine outside of the following limit should be considered **grounds for failure of the critical task**:

- Trip the Main Turbine to ensure that it does not cause a continuous excessive cooldown rate or Tcold to be less than 329°F.
- Once the reactor is shutdown, prompt isolation of the turbine steam flow path is significant. Until the major steam flow path through the turbine to the condenser is isolated, RCS heat removal will be much larger than heat generation, and a rapid RCS cooldown will continue. (Source: OP-TM-EOP-0011)

Safety Significance: When the reactor is tripped (shutdown), steam flow to the main turbine must be stopped in order to maintain the appropriate primary to secondary heat balance. When the appropriate primary to secondary heat balance is established, the normal heat removal systems are available for plant control thus enhancing the transient mitigation capability of the plant. If the turbine steam flow path is not isolated after a rapid reduction in reactor heat generation (reactor trip), extremely rapid RCS cooldown is possible. Prompt operator action can minimize the extent of this overcooling and potential consequences to RCS pressure boundary. A prolonged rapid cooldown will complicate plant control and could challenge OTSG tube integrity or Reactor Vessel integrity.

Cues:

- Visual indications (closed generator output and exciter breakers, main turbine stop and control valves are not closed)
- P-T display and associated alarms
- Verbal alert by plant staff that all main turbine stop and control valves are not closed immediately following actuation of a reactor trip signal
- Verbal alert by plant staff that main alternator output/exciter breakers are not open immediately following actuation of a reactor trip signal

Performance Indicators:

- Operation of control room manual main turbine trip pushbutton
- Main turbine trip alarm
- Main turbine-generator exciter alarms
- Main turbine-generator breaker status alarms

Feedback:

- RC temperature and pressure
- SG level and pressure
- Mega-Watt electric indication
- Main turbine-generator breaker status indications
- Verbal notification by plant staff of main turbine trip status

Event	Description	Procedure Support
	Initial Set-up.	100% Power, MOL SBO Tagged OOS due to maintenance
1	BWST level lowers	OP-TM-MAP-E0204, BWST Level Lo
		Tech Spec 3.3.1.1a
2	Isolable Steam Leak in Turbine Building	OP-TM-AOP-051
3	SG/RX Demand Station fails to Zero Volts	OP-TM-AOP-070, Primary to Secondary Heat Transfer Upset
4	High Vibrations on Main Turbine	OP-TM-MAP-K0201, MN TURB VIBR/ECC HI
		1102-4, Power Operations
5	Inadvertent 1600# ESAS	OP-TM-AOP-046, Inadvertent ESAS Actuation
		Tech Spec 3.5.1.1
6	Loss of 1D 4Kv Bus	OP-TM-AOP-013, Loss of 1D 4Kv Bus
		T.S. 3.7.2.f
		OP-TM-861-901, Diesel Generator EG-Y-1A Emergency Operations
		OP-TM-541-444, Swap NS-P-1B to Alternate Power Supply
7	Generator Stator Cooling Runback / Reactor Trip	OP-TM-MAP-L0107, Gen Stator Clg Loss Runback
		OP-TM-EOP-001, Reactor Trip
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
8	Loss of Off-Site Power	OP-TM-AOP-020, Loss of Station Power
		OP-TM-861-902, Diesel Generator EG-Y-1A Emergency Operations
		OP-TM-AOP-041, Loss of Seal Injection
9	EG-Y-1B Trips / Electrical Blackout	OP-TM-AOP-020, Loss of Station Power
		OP-TM-AOP-041, Loss of Seal Injection
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-242 MOL	100% HFP ICS full AUTO	Equilibrium XENON
Remote DHR32	Value: 85.5 Ramp 15 Seconds When: EVENT 1	BWST Level Lowers
Malfunction MS19A	Value: 1 When: EVENT 2	Steam Line Break in the Turbine Building
Malfunction IC23	Value: Insert When: EVENT 3	S/G RX Demand Fails to 0 volts
Malfunction TU01D	Value: 50 Ramp 30 Seconds When: EVENT 4	Turbine Bearing 4 High Vibrations
Override 0SA4S66 SDIPB1RCA	Value: ON When: EVENT 5	1600# Manual ESAS Pushbutton
Malfunction ED05D	Value: Insert When: EVENT 6	1D 4160V Bus Fault
Malfunction EG04A	Value: Insert When: EVENT 7	"A" Stator Cooling Pump Trip
Malfunction EG04B	Value: Insert When: EVENT 7	"B" Stator Cooling Pump Trip
Malfunction TC09A	Value: Insert When: EVENT 7	Turbine Control Valve 1 Failure
Malfunction TC09B	Value: Insert When: EVENT 7	Turbine Control Valve 2 Failure
Malfunction TC09C	Value: Insert When: EVENT 7	Turbine Control Valve 3 Failure
Malfunction TC09D	Value: Insert When: EVENT 7	Turbine Control Valve 4 Failure
Malfunction ED01	Value: Insert When: EVENT 8	Loss of Off-Site Power
Malfunction EG07B	Value: Insert When: EVENT 9	EG-Y-1B trips
Remote MUR12	Value: OPEN When: EVENT 20	MU-V-76A / B Open

Op Test No.:	1	Scenario #	2	Event #	1	Page	14 of 42
Event Description:	BWST Level Lowers						

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR: When directed by the Lead Examiner INITIATE EVENT 1.		
Indications Available:		**Main Annunciator E-3-4 in alarm, BWST digital indicators (LI-808-A/B) lower until approximately 54', PPC Points A0486 and A0487 lower until approximately 54'.**
	Crew	Diagnoses a lowering of BWST level and stabilizing at approximately 54'.
	CRS	Directs entry into OP-TM-MAP-E0304, BWST TEMP/LVL HI/LO.
Booth Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to investigate the BWST level lowering, report that "The crane working near the BWST has swung its' load into the BWST and pierced it. There is no visual indication of further water coming out of the hole in the BWST".**
		OP-TM-MAP-E0304, BWST TEMP/LVL HI/LO
	ARO	Step 4.1.1: Determines that console and computer level indications are accurate. (A0486 and (A0487)
	CRS	Step 4.1.5: Determines that BWST level indication is less than 56.0 ft and Reactor is not shutdown, and declares entry into TS 3.3.1.1.a. (1 hour).
Examiner's Note:		**T.S. 3.3.1.1.a: The Borated Water Storage Tank (BWST) shall contain a minimum of 350,000 gallons of water having a minimum concentration of 2,500 ppm boron at a temperature not less than 40°F. If the boron concentration or water temperature is not within limits, restore the BWST to OPERABLE within 8 hrs. If the BWST volume is not within limits, restore the BWST to OPERABLE within one hour.** **Specification 3.0.1 applies.**

Op Test No.:	1	Scenario #	2	Event #	1	Page	15 of 42
Event Description:	BWST Level Lowers						

Time	Position	Applicant's Actions or Behavior
	CRS	Briefs a Reactor Shutdown IAW 1102-4, Power Operations
Examiner's Note:		**The crew may decide to commence with the power reduction IAW 1102-4. The steps are listed in the next Event since they are required to be performed there.**
Examiner's Note:		**Once the Tech Spec is called, Go to Event 2.**

Op Test No.:	1	Scenario #	2	Event #	2	Page	16 of 42
Event Description:		Isolable Steam Leak in the Turbine Building					

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR:		**When directed by the Lead Examiner INITIATE EVENT 2.**
Indications Available:		**Lowering Generated MWe, Lowering Tave, Reactor Power rising**
Booth Cue:		**Report, as Auxiliary Operator, "There is a large steam leak on the North Side of the Turbine Building. Specific location is unknown.**
	Crew	Diagnoses the steam leak
	CRS	Announces entry into OP_TM-AOP-051, Secondary Side High Energy Leak.
		OP-TM-AOP-051, Secondary Side High Energy Leak
	ARO	Step 3.1: ANNOUNCE entry into OP-TM-AOP-051, "Secondary Side High Energy Leak" and to evacuate affected area over the plant page and radio.
	URO	Step 3.2: MAINTAIN reactor power < 100%.
Examiner's Note:		**Steps 3.3 through 3.5 are N/A**
	CRS	Step 3.6: REQUEST SM to evaluate EALs.
Examiner's Note:		**Steps 3.7 and 3.8 are N/A**
	CRS	Step 3.9: If leak is in Turbine Building, then GO TO Section 6.0

Op Test No.:	1	Scenario #	2	Event #	2	Page	17	of 42
Event Description:	Isolable Steam Leak in the Turbine Building							

Time	Position	Applicant's Actions or Behavior
		SECTION 6.0, TURBINE BUILDING
	CRS	Step 6.1: CONSIDER evacuating the following: • Operations Office Building using the back stairwell. • Telephone Equipment Room in the Service Building.
Examiner's Note:		**The crew can perform isolation of A or B side of the Turbine Bldg**
Booth Cue:		**When requested by the Control Room to report the status of the steam leak following closure of MS-V-5A, report "The steam leak IS NOT isolated.** **When requested by the Control Room to report the status of the steam leak following closure of MS-V-5B, report "The steam leak IS isolated".**
	ARO	Step 6.3: If power >40% or FW-P-1B is tripped, then determine if leak is downstream of MS-V-5B by performing the following: • CLOSE MS-V-5B • If steam leak is isolated, then GO TO Section 7.0 • OPEN MS-V-5B
		SECTION 7.0, RETURN TO NORMAL
	N/A	Step 7.1: If MS-V-1C and MS-V-1D are Closed, then perform the following: • Ensure Aux Boilers are operating IAW OP-TM-414-401 / 402, Starting AS-B-1A / 1B • ENSURE Gland Seal System in Plant Shutdown Mode IAW OP-TM-314-000, Gland Seal System.

Footnotes:
1 – FW-P-1A: Feedwater Pump 1A
2 – MS-V-5B: Main Steam Supply to "B" Main Feed Pump Turbine
3 – MS-V-1C/1D: Main Steam Isolation of "B" OTSG "C" / "D" Line
4 – AS-B-1A/1B: 1A/1B Auxiliary Boilers

Op Test No.:	1	Scenario #	2	Event #	2	Page	18 of 42
Event Description:		Isolable Steam Leak in the Turbine Building					

Time	Position	Applicant's Actions or Behavior
	CRS	Step 7.2: EVALUATE T.S. implications of valves closed to isolate the leak.
	CRS	Step 7.3: ENSURE clearance or EST are applied to valves manipulated to isolate the leak.
	ARO	Step 7.4: REVIEW transient cycle logbook and LOG cycles as required
	ARO	Step 7.5: ENSURE only one of the following is running: • AH-E-24A • AH-E-24B
Examiner's Note:		**Once the leak is isolated and plant is stable, GO TO Event 3**

Footnotes: 1 – AH-E-24A / 24B: Emergency Feed Pumps Cooling Fans

Op Test No.: 1	Scenario # 2	Event # 3	Page 19 of 42
Event Description:	SG/RX Demand Station Fails to 0 Volts		

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR:		**When directed by the Lead Examiner INITIATE EVENT 3.**
Indications Available:		**Power reduces quickly, Main Annunciators H-2-1, H-1-4, and H-3-2 in alarm, RCS Pressure reduces.**
	Crew	Diagnoses an ICS transient.
	CRS	DIRECTS entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	URO	Step 2.1 (**IMA**): ENSURE diamond station in MAN and INSERT control rods as necessary to reduce power below Reactor power limit and for gross balance with total FW flow.
	ARO	Step 2.2 (**IMA**): ENSURE both SG A & B FW DEMAND in HAND and ADJUST FW Flow to stabilize Tavg at the current RCS temperature.
	URO	Step 2.3 (**IMA**): VERIFY Turbine Header Pressure is between 835 and 935 psig. (MAP H-2-3 is not in alarm)
	URO	Step 2.4 (**IMA**): VERIFY RCS pressure is lowering or less than 2205 psig. As required, if RCS Pressure is >2205 psig, URO places RC-V-1 control in Manual (CC), opens RC-V-1 fully by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC), and then places RC-V-1 control back to AUTO.

Footnotes: 1 – RC-V-1: Pressurizer Spray Valve

Op Test No.:	1	Scenario #	2	Event #	3	Page	20 of 42
Event Description:	SG/RX Demand Station Fails to 0 Volts						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**OP-TM-AOP-070, Steps 3.1 and 3.2 are IAAT's that should not be applicable during this Event.**
	CRS	Step 3.3: VERIFY Main Turbine is RESET
	CRS	Step 3.4: Assigns manual control responsibilities and control bands as follows:
	URO	INSERT or WITHDRAW rods to maintain Reactor power within 1% of current power level by operating the Control Rod switch on the Diamond Panel as applicable (CC).
	ARO	Adjust FW Flow to maintain Tavg within 2 °F of current temperature by adjusting SG A and SG B FW Demand Station toggle switches as applicable (CC). Maintain Turbine Hdr Pressure within 10 psig of current pressure by adjusting Turbine Load Set Station demand as applicable (CC).
	URO	Step 3.6: ENSURE the following ICS stations are in HAND. • SG/Reactor Demand • Reactor Demand • SG A/B Load Ratio • ULD
	CRS	Step 3.7: VERIFY both of the following: • Operating MFW Pumps are controlling FW Valve dP greater than 30 psid. • Reactor power is greater than 75%.
Examiner's Note:		**OP-TM-AOP-070, Step 3.8 is N/A and 3.9 has already been verified.**

Footnote: 1 – ULD: Unit Load Demand

Op Test No.: 1	Scenario # 2	Event # 3	Page 21 of 42
Event Description:	SG/RX Demand Station Fails to 0 Volts		

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.10: MAINTAIN RCS pressure between 2105 and 2205 psig and slowly ADJUST feedwater flow to control RCS Tavg 578 to 580°F.
	ARO	Step 3.11: MAINTAIN RCS Tavg 578 to 580°F and slowly ADJUST loop feedwater flows to control RCS $\Delta Tc < 5°$ F.
Examiner's Note:		**OP-TM-AOP-070, Steps 3.12 and 3.13 are N/A.**
Examiner's Note:		**Once the Plant has been stabilized, GO TO Event 4.**

Op Test No.:	1	Scenario #	2	Event #	4	Page	22 of 42
Event Description:	High Vibrations on Main Turbine						

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR:		**When directed by the Lead Examiner INITIATE EVENT 4.**
Indications Available:		**Main Annunciator K-2-1 in alarm, Multiple PPC alarms.**
	Crew	Diagnosis High Vibrations on Main Turbine.
	CRS	Directs entry into OP-TM-MAP-K0201, MN TURB VIBR/ECC HI
Booth Cue:		**If contacted as Electrical Maintenance and/or the Maintenance Director, acknowledge directions.**
		OP-TM-MAP-K0201, MN TURB VIBR/ECC HI
	ARO	Step 4.2: Determines that the unit is at power and vibrations are > 6 Mils, and notifies Electrical Maintenance and the Maintenance Director.
	CRS	Step 4.3: Determines that the unit is at power, and directs the URO to reduce load to ≤ 45 percent.
Examiner's Note:		**OP-TM-MAP-K0201, Steps 4.3-4.9 are N/A.**
		1102-4, Power Operations
	CRS	Step 3.3.2.A.1: PERFORM Enclosure 2A (for an emergency (forced) power reduction INITATE Enclosure 2A).
	CRS	Step 3.3.2.A.2.a: If power change is greater than 10 MWe, then NOTIFY the following: • Power Team • TSO • NDO

Op Test No.:	1	Scenario #	2	Event #	4	Page	23 of 42
Event Description:	High Vibrations on Main Turbine						

Time	Position	Applicant's Actions or Behavior
	CRS	Step 3.3.2.A.3.c: If SG/REACTOR DEMAND is in HAND, then REDUCE reactor power IAW OP-TM-621-471 "ICS Manual Control".
		OP-TM-621-471, ICS Manual Control
	URO	Step 4.6.3: If necessary to maintain reactor power or control rods within limits or if a power change is being conducted IAW 1102-4, then INSERT or WITHDRAW control rods.
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	ARO	Step 3.10 and 3.11: Maintains RCS pressure between 2105 and 2205 psig, controls RCS Tavg 578 to 580 °F, and controls RCS ΔTc < 5° F by adjusting SG A and SG B FW Demand Station toggle switches as applicable.
Examiner's Note:		**Once sufficient reactivity manipulation is observed and RCS pressure is low in the band, Go to Event 5.**

Op Test No.: 1	Scenario # 2	Event # 5	Page 24 of 42
Event Description:	Inadvertent 1600# ESAS Actuation		

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR: When directed by the Lead Examiner INITIATE EVENT 5.		
Indications Available:		**Multiple Main Annunciator Panel Alarms illuminated, MU-P-1A running, ES positions indicated on PCR for "A" Train components.**
	Crew	Diagnoses an Inadvertant ES Actuation, "A Train 1600#.
	CRS	Direct entry into OP-TM-AOP-046, Inadvertant ESAS Actuation.
		OP-TM-AOP-046, Inadvertant ESAS Actuation
	URO/ARO	Step 2.1 (**IMA**): Defeats invalid ESAS signals by pressing "Defeat / Enable" pushbuttons for each of three channels, verifying that the amber "Defeat" light is lit for each channel and the blue Block load lights are not lit for each channel (PCR).
	URO	Step 2.2 (**IMA**): Determines that MU-P-1A is not required for seal injection and secures it by rotating the Control Switch in the counter-clockwise direction and verifying the green flag indicator is visible, and that the green Off light is lit and the red Running light is not lit.
Examiner's Note:		**Once MU-P-1A is secured, MU-V-16A and MU-V-16B will have flow based on MU-P-1B operating.**
	URO	Step 2.3 (**IMA**): Throttles MU-V-16A / 16B with HPI flow to maintain MU-P-1B flow > 115 gpm.
	ARO	Step 3.1: Announces entry into OP-TM-AOP-046, "Inadvertent ESAS Actuation" over the plant page and radio.

Footnotes:
1 – MU-P-1A: Makeup Pump 1A
2 – MU-V-16A: "A" High Pressure Injection Control Valve
3 – MU-V-16B: "B" High Pressure Injection Control Valve

Op Test No.:	1	Scenario #	2	Event #	5	Page	25 of 42
Event Description:	Inadvertent 1600# ESAS Actuation						

Time	Position	Applicant's Actions or Behavior
	URO	Step 3.3: Ensures MU-V-36 is Open by pressing the open pushbutton and verifying the red open light is lit and the green closed light is not lit (CC). MU-V-37 is already open, evidenced by red open light lit and green closed light not lit (CC).
Examiner's Note:		**Steps 3.4 through 3.8 are N/A**
	URO	Step 3.9: If Mu-V-77A & 77B are OPEN, then perform the following: • ENSURE MU-V-16A is Closed • ENSURE MU-V-16B is Closed
Examiner's Note:		**Steps 3.10 and 3.11 are N/A**
	URO	Step 3.12: Ensures MU-V-14A is Closed by pressing the close pushbutton and verifying the green closed light is lit and the red open light is not lit (CC). MU-V-14B is already closed, evidenced by green closed light lit and red open light not lit (CC).
Examiner's Note:		**Step 3.13 is N/A**
	ARO	Step 3.14: If at power, then ENSURE two Secondary River pumps are running.

Footnotes:
1 – MU-V-36: Makeup Pump Recirc Valve
2 – MU-V-37: Makeup Pump Recirc Valve
3 – MU-V-77A: MU-P-1A/B Discharge Header Cross-Connect Valve
4 – MU-V-77B: MU-P-1A/B Discharge Header Cross-Connect Valve
5 – MU-V-16A: "A" High Pressure Injection Control Valve
6 – MU-V-16B: "B" High Pressure Injection Control Valve
7 – MU-V-14A: Makeup Pump Suction Valve from BWST
8 – MU-V-14B: Makeup Pump Suction Valve from BWST

Op Test No.:	1	Scenario #	2	Event #	5	Page	26	of	42
Event Description:		Inadvertent 1600# ESAS Actuation							

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.15: INITIATE an alarm review.
	ARO	Step 3.16: Initiates OP-TM-211-950, "Restoration of Letdown Flow."
	CRS	Step 3.18: REVIEW Tech Specs for ES operability impact.
		OP-TM-211-950, Restoration of Letdown Flow
	ARO	Section 3.0: Reviews Precautions, Limitations, and Prerequisites.
Booth Cue:		**If contacted to verify integrity of Letdown Line, state " The integrity of the Letdown Line to MU-T-1 has been assessed and the Letdown line is intact".**
Examiner's Note:		**Steps 4.1 through 4.4 are N/A.**
	ARO	Step 4.5: Ensures: • MU-V-3 is closed by observing green closed light lit, red open light not lit. • MU-V-4 is closed by pressing the green closed light, observing green closed light lit, red open light not lit. • MU-V-5 is closed by pressing the Control Station toggle switch in the downward direction, observing the carrot position indicator is pointing to zero.
	ARO	Step 4.7: Verifies MU-V-1A and MU-V-1B are Open by the indicating lights for each being red (not green) (CC)

Footnotes:
1 – MU-V-3: RCS Letdown Reactor Bldg Isolation Valve
2 – MU-V-4: Letdown Orifice Isolation Valve
3 – MU-V-5: Letdown Flow Control Bypass
4 – MU-V-1A: "A" Letdown Cooler Inlet Isolation Valve
5 – MU-V-1B: "B" Letdown Cooler Inlet Isolation Valve

Op Test No.:	1	Scenario #	2	Event #	5	Page	27	of 42
Event Description:		Inadvertent 1600# ESAS Actuation						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 4.8.2: Verifies MU-V-2A and MU-V-2B are Open by the indicating lights for each being red (not green) (CC)
	ARO	Step 4.9.2: Throttles MU-V-5 to 10% open by operating the dial on the MU-V-5 Control Station to the 10 position.
	ARO	Step 4.10: Verifies MU-V-8 is aligned to the Thru position by the indication Thru to filters lit and Bleed indication not lit (CC)
	ARO	Step 4.11: Opens MU-V-3 by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC)
	ARO	Step 4.14: Raises letdown flow at < 2.5 gpm/min to desired flow by operating the dial on the MU-V-5 Control Station in the clockwise direction to open MU-V-5 gradually.
	CRS	Declares a 3.5.1.1 (72 Hours) Tech Spec LCO time clock.

Footnotes:
1 – MU-V-3: RCS Letdown Reactor Bldg Isolation Valve
2 – MU-V-5: Letdown Flow Control Bypass Valve
3 – MU-V-2A : "A" Letdown Cooler Outlet Valve
4 – MU-V-2B: "B" Letdown Cooler Outlet Valve
5 – MU-V-8: Letdown Split Valve to MU-T-1 or RCBT
6 – MU-T-1: Makeup Tank
7 –RCBT: Reactor Coolant Bleed Tank

Op Test No.: 1	Scenario # 2	Event # 5	Page 28 of 42
Event Description:	Inadvertent 1600# ESAS Actuation		

Time	Position	Applicant's Actions or Behavior

Examiner's Note: **Tech Spec 3.5.1.1 The reactor shall not be in a startup mode or in a critical state unless the requirements of Table 3.5-1, Column "A" and "B" are met, except as provided in Table 3.5-1, Column "C". Specification 3.0.1 applies.**

TABLE 3.5-1
INSTRUMENTS OPERATING CONDITIONS
C. Engineered Safety Features

Functional Unit	(A) Minimum Operable Channels	(B) Minimum Degree of Redundancy	(C) Operational Action if Conditions of Column A and B Cannot Be Met
Engineered Safety Features: 1.c: Manual Pushbutton	2	N/A	(g)

(g) The Operability requirement is for the manual actuation switch for the specified feature on each train to be OPERABLE.

1. If the manual actuation switch on one train is inoperable, restore the switch to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 6 hours.

2 If both manual actuation switches for that feature are inoperable, then place the reactor in HOT SHUTDOWN in 6 hours and COLD SHUTDOWN within the following 24 hours.

Examiner's Note: **Once Letdown has been restored, Go to Event 6.**

Op Test No.:	1	Scenario #	2	Event #	6	Page	29 of 42
Event Description:	Loss of 1D 4160VAC Bus						

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR:		**When directed by the Lead Examiner INITIATE EVENT 6.**
Indications Available:		**Equipment lost, PPC alarms, MAP alarms, ½ of Control Room lighting going out, EG-Y-1A running, 1D 4Kv Over-current alarms.**
BOOTH Cue:		**The crew may contact an NLO and/or maintenance to investigate 1D 4KV bus. If so, no response will be given (delay as necessary).**
	URO	Diagnoses the loss of 1D 4Kv Bus.
	CRS	Directs entry into OP-TM-AOP-013, Loss of 1D 4Kv Bus.
		OP-TM-AOP-013, Loss of 1D 4Kv Bus.
	CRS	Determines the entry conditions are met based on: All of the following: • 1D 4160V bus is deenergized or recovered by EG-Y-1A • At least one auxiliary transformer is energized • The OTSGs are being used for RCS heat removal
		OP-TM-AOP-013, Loss of 1D 4Kv Bus, Section 3.0
	ARO	Step 3.1: Announce entry into OP-TM-AOP-013, "Loss of 1D 4160V Bus" over the "RED" plant page and radio.
	ARO	Step 3.2: Initiate OP-TM-861-901, "Diesel Generator EG-Y-1A Emergency Operations".
	URO	Step 3.3: Verify seal injection flow >22 gpm.

Footnote: 1 – EG-Y-1A: "A" Emergency Diesel Generator

Op Test No.:	1	Scenario #	2	Event #	6	Page	30 of 42
Event Description:		Loss of 1D 4160VAC Bus					

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**Steps 3.4 through 3.6 are N/A**
	URO	Step 3.7: ENSURE IC-P-1B is operating.
	ARO	Step 3.8: ENSURE NS-P-1C is operating.
Examiner's Cue:		**If the crew initiates OP-TM-541-444, it may be performed but is not required to continue in the scenario.**
	ARO	Step 3.9: INITIATE OP-TM-541-444 "Swap NS-P-1B to alternate power supply".
	ARO	Step 3.10: ENSURE the following NR pumps operating as required for NS or IC temperature control: • NR-P-1B-T, • NR-P-1C.
	ARO	Step 3.12: ENSURE the following SC pumps operating: • SC-P-1A, • SC-P-1B.
	ARO	Step 3.13: ENSURE the following SR pumps are operating: • SR-P-1B, • SR-P-1C.

Footnotes:
1 – IC-P-1B: "B" Intermediate Closed Cooling Water Pump
2 – NS-P-1B: "B" Nuclear Service Closed Cooling Water Pump
3 – NS-P-1C: "C" Nuclear Service Closed Cooling Water Pump
4 – NR-P-1B: "B" Nuclear Service River Water Pump
5 – NR-P-1C: "C" Nuclear Service River Water Pump
6 – SC-P-1A: "A" Secondary Service Closed Cooling Water Pump
7 – SC-P-1B: "B" Secondary Service Closed Cooling Water Pump
8 – SR-P-1B: "B" Secondary Service River Water Pump
9 – SR-P-1C: "C" Secondary Service River Water Pump

Op Test No.:	1	Scenario #	2	Event #	6	Page	31 of 42
Event Description:		Loss of 1D 4160VAC Bus					

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.14: INITIATE an alarm review.
	CRS	Step 3.15: REQUEST SM evaluate Emergency Action Levels (EALs).
	ARO	Step 3.16: If the main turbine is "on line", then PLACE LOP-6 in "PTL".
Examiner's Note:		**Tech Spec 3.7.2.f The engineered safeguards electrical bus, switchgear, load shedding, and automatic diesel start systems shall be operable**
Examiner's Note:		**After the Tech Spec call is made, go to Event 7.**

Footnote: 1 – LO-P-6: Main Turbine Emergency Bearing Oil Pump

Op Test No.: 1	Scenario # 2	Event # 7	Page 32 of 42
Event Description:	Loss of Stator Coolant Pumps / Reactor Trip		

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR:		**When directed by the Lead Examiner INITIATE EVENT 7.**
Indications Available:		**Stator Cooling Pump Trip, PPC alarms for Stator Temperatures, MAP alarms L-1-7 and L-2-7 actuated.**
	CREW	Announce "Generator Stator Coolant Runback"
	ARO	Identifies the trip of GN-P-5A, Stator Water Cooling Pump.
		OP-TM-MAP-L-2-7, GEN STATOR STBY CLG PUMP RUN
	ARO	Step 4.0: Ensure standby pump started (pump indication lights on PLF)
	ARO	Reports the standby Stator Water Cooling pump failed to start.
Examiner's Note:		**The following Automatic Actions would normally occur:** • **Turbine control valves Close at 23.4% vwo/min.** • **Turbine control trips to HAND on ICS station and ICS goes into track.** • **Turbine trips after 2 minute time delay should turbine not runback to average generator current < 25, 474 amps (approx plant load of 95% power).** • **Turbine trips after 3.5 minute time delay should turbine not runback to average generator current < 9322 amps (approx plant load of 29.6% power).** **However, the Turbine Control Valves DO NOT Close in this scenario.**
		MAP L-1-7, GEN STATOR CLG LOSS RUNBACK
	CRS	Step 4.1: IAAT Reactor power is > 45% and the Turbine trips, then GO TO OP-TM-EOP-001, "Reactor Trip".
	ARO	Step 4.2: IAAT Reactor power is < 45% and the Turbine trips, then GO TO OP-TM-MAP-K0101.

Op Test No.:	1	Scenario #	2	Event #	7	Page	33	of 42
Event Description:	Loss of Stator Coolant Pumps / Reactor Trip							

Time	Position	Applicant's Actions or Behavior
	CRS	INITIATE 1102-4, Power Operations
Examiner's Note:		**The ARO may report that Main Turbine Control Valves are not closing or based on ICS in Hand Control during a turbine runback and an upset of the Primary to Secondary parameters, the CRS may direct the Reactor and Main Turbine tripped.**
	ARO	Reports Main Turbine Control valves are not closing.
	CRS	Directs the URO to manually trip the Reactor and perform IMA's of OP-TM-EOP-001, Reactor Trip.
		OP-TM-EOP-001, Reactor Trip
	URO	Step 2.1 **(IMA)**: PRESS both Reactor Trip and DSS pushbuttons.
	URO	Step 2.2 **(IMA)**: Verify Reactor Shutdown
CT-18	URO	Step 2.3 **(IMA)**: PRESS Turbine Trip pushbutton.
	URO	Step 2.4 **(IMA)**: VERIFY the turbine stop valves are Closed
	URO	Step 3.1: Performs a Symptom Check and reports "Symptom Check is Negative".
Examiner's Note:		**After Symptom Check is performed, GO TO Event 8**

Op Test No.:	1	Scenario #	2	Event #	8	Page	34 of	42
Event Description:		Loss of Off-Site Power						

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR: When directed by the Lead Examiner INITIATE EVENT 8.		
Indications Available: Control Room lights go out, Makeup Pump 1B trips, loss of Makeup, and Seal Injection flows.		
	CRS	Diagnoses the loss of offsite power.
	CRS	Directs entry into OP-TM-AOP-020, Loss of Station Power.
		OP-TM-AOP-020, Loss of Station Power
	ARO	Step 3.1: INITIATE "Emergency Feedwater".
	ARO	Step 3.2: INITIATE OP-TM-861-901, "EG-Y-1A Emergency Operations" and OP-TM-861-902, "EG-Y-1B Emergency Operations".
	URO	Step 3.3: VERIFY 1D 4160V and 1E 4160V bus are energized. RNO: If only one ES 4160V bus is energized, then INITIATE OP-TM-864-901, "SBO Diesel Generator (EG-Y-4) Operations" to energize the affected ES 4160V bus.
	URO	Step 3.4: VERIFY one of the following pumps operating: • IC-P-1A • IC-P-1B
	CRS	Step 3.5: VERIFY seal injection flow > 22 gpm. RNO: INITIATE OP-TM-AOP-041, "Loss of Seal Injection".

Footnotes:
1 – EG-Y-1A: "A" Emergency Diesel Generator
2 – EG-Y-1B: "B" Emergency Diesel Generator
3 – EG-Y-4: Station Blackout Diesel Generator
4 – IC-P-1A: "A" Intermediate Closed Cooling Water Pump
5 – IC-P-1B: "B" Intermediate Closed Cooling Water Pump

Op Test No.: 1	Scenario # 2	Event # 8	Page 35 of 42	
Event Description:	Loss of Off-Site Power			

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**Details of OP-TM-AOP-041 are on Page 37.**
	CRS	Step 3.6: REQUEST SM evaluate Emergency Action Levels (EALs)
	URO	Step 3.7: Initiate OP-TM-EOP-010 Guide 10, Natural Circulation
Examiner's Note:		**Specific details of Guide 10 are on Page 39.**
	CRS	Step 3.8: CONTACT system dispatcher to get an estimate for when to expect offsite power restoration.
	URO	Step 3.9: IAAT Tcold < 525°F, then INITIATE Emergency boration per Rule 5.
Examiner's Note:		**Step 3.10 is N/A**
	ARO	Step 3.11: INITIATE OP-TM-220-901 to transfer Grp 8 or 9 pressurizer heaters to ES power.
	ARO	Step 3.12: VERIFY LO-P-6 Emergency Bearing Oil Pump or LO-P-5 Turning Gear Oil Pump is operating.
Examiner's Note:		**Step 3.13 requires no action.**
	ARO	Step 3.14: VERIFY GN-P-2 Emergency DC Seal Oil Pump is operating.

Footnotes: 1 – LO-P-6: Main Turbine Emergency Bearing Oil Pump
2 – GN-P-2: Emergency Seal Oil Pump

Op Test No.:	1	Scenario #	2	Event #	8	Page	36 of 42
Event Description:		Loss of Off-Site Power					

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.15: INITIATE action to break vacuum in the main and auxiliary condensers, and isolate Gland Steam by performing the following: • OPEN VA-V-8 • OPEN VA-V-4A • OPEN VA-V-4B • PLACE all VA-P-1s in PTL • PLACE all VA-P-2s in PTL • When condenser vacuum < 10in Hg vac then CLOSE MS-V-7
	URO	Step 3.16: INITIATE generator hydrogen vent to atmosphere.
	URO	Step 3.17: IAAT 1D 4160V bus cannot be energized then • INITIATE OP-TM-732-901, "Energize 1P 480V Bus using ES Bus Cross Tie". • INITIATE OP-TM-AOP-023 "A" DC System Failure.
Examiner's Note:		**Step 3.18 is N/A at this time.**
	ARO	Step 3.19: START AH-E-24A or AH-E-24B
	ARO	Step 3.20: INITIATE 1104-19, "Control Building Ventilation System" section "Emergency Operation After Station Blackout".

Footnotes:
1 – VA-V-8: Main Condenser Vacuum Breaker Valve
2 – VA-V-4A: "A" Aux Condenser Vacuum Breaker Valve
3 – VA-V-4B: "B" Aux Condenser Vacuum Breaker Valve
4 - VA-P-1's: Main Condenser Vacuum Pumps
5 - VA-P-2's: Aux Condenser Vacuum Pumps
6 – MS-V-7: Main Steam to Gland Steam System Isolation Valve
7 – AH-E-24A : "A" Emergency Feed Pump Air Handling Fan
8 – AH-E-24B: "B" Emergency Feed Pump Air Handling Fan

Op Test No.:	1	Scenario #	2	Event #	8	Page	37 of 42
Event Description:		Loss of Off-Site Power					

Time	Position	Applicant's Actions or Behavior
		OP-TM-AOP-041, Loss of Seal Injection
	URO	Step 3.2: IAAT ICCW flow < 550 GPM and #1 seal inlet temperature > 235°F, then perform the following: • CLOSE MU-V-20. • GO TO OP-TM-226-901, "Loss of All RCP Seal Cooling".
	URO	Step 3.3: ENSURE MU-V-32 is in HAND and Closed.
	URO	Step 3.5: Determines that a Makeup Pump is not running and IAW the RNO, performs the following: • ENSURE MU-V-3 is Closed. • ENSURE MU-V-17 is Closed. • VERIFY [MU tank level >40"] or [MU-V-14A or B is Open]. • If MU tank level was < 18" at any time, then PERFORM OP-TM-211-271 to vent the MU pumps. • If MU-V-77 A & B are Open, then GO TO section 4.0. • If MU-P-1C is unavailable, then GO TO Section 5.0. • GO TO Section 6.0.
Booth Cue:		**When directed as an Auxiliary Operator to Open MU-V-76A and MU-V-76B, Insert Event 20 and then report that MU-V-76A and MU-V-76B are OPEN**

Footnotes:
1 – MU-V-20: RCP Seal Injection RB Isolation Valve
2 – MU-V-32: RCP Seal Injection Control Valve
3 – MU-V-3: RCS Letdown RB Isolation Valve
4 – MU-V-17: Normal Makup to RCS Control Valve
5 – MU-V-77A: MU-P-1A/B Discharge Header Cross-Connect Valve
6 – MU-V-77B: MU-P-1A/B Discharge Header Cross-Connect Valve
7 – MU-V-14A: Makeup Pump Suction Valve from BWST
8 – MU-V-14B: Makeup Pump Suction Valve from BWST
9 – MU-P-1C: "C" Makeup Pump
10 – MU-V-76A: MU-P-1B/C Discharge Header Cross-Connect Valve
11 – MU-V-76B: MU-P-1B/C Discharge Header Cross-Connect Valve

Op Test No.:	1	Scenario #	2	Event #	8	Page	38	of 42
Event Description:	Loss of Off-Site Power							

Time	Position	Applicant's Actions or Behavior
	URO	Step 6.0: Determines that MU-V-76A and MU-V-76B are closed as well as HPI train A and Normal MU header piping is intact, and then directs an Auxiliary Operator to open MU-V-76A and MU-V-76B.
	URO	Step 6.1 / 6.2: Verifies MU-P-1C is ES selected and that MU-V-36 and MU-V-37 are open.
	URO	Step 6.3: • Starts DR-P-1B by rotating the Control Switch clockwise, verifying red flag indicated, red running light lit, green secured light not lit. (CC) • Starts DC-P-1B by rotating the Control Switch clockwise, verifying red flag indicated, red running light lit, green secured light not lit. (CC)
	URO	Step 6.4: Starts MU-P-1C by rotating the Control Switch clockwise, verifying red flag indicated, red running light lit, green secured light not lit. (CC)
	URO	Step 3.6: VERIFY #1 seal temperatures are < 235°F.
	URO	Step 3.7: VERIFY MU-V-20 is Open

Footnotes:
1 – MU-V-76A: MU-P-1B/C Discharge Header Cross-Connect Valve
2 – MU-V-76B: MU-P-1B/C Discharge Header Cross-Connect Valve
3 – MU-P-1C: "C" Makeup Pump
4 – MU-V-36: Makeup Pump Recirc Valve
5 – MU-V-37: Makeup Pump Recirc Valve
6 – DR-P-1B: "B" Decay River Water Pump
7 – DC-P-1B: "B" Decay Closed Cooling Water Pump
8 – MU-V-20: RCP Seal Injection RB Isolation Valve

Op Test No.:	1	Scenario #	2	Event #	8	Page	39 of 42
Event Description:		Loss of Off-Site Power					

Time	Position	Applicant's Actions or Behavior
	URO	Step 3.8: Slowly adjusts MU-V-32 for 38 gpm seal injection flow rate, while limiting RCP radial bearing cooldown rate to less than 1°F/minute.
		OP-TM-EOP-010 Guide 10, Natural Circulation
CT-12	ARO	If all of the following conditions exist, then adequate Natural Circulation is present: • RCS THOT minus TCOLD stabilizes at less than 50°F. • THOT < 600°F • Incore temperature stabilizes and tracks THOT. • Cold let temperatures approach saturation temperature for secondary side pressure. • OTSG heat removal is indicated by feeding or steaming with stable OTSG pressure. • SCM < 25°F
Examiner's Note:		**When Natural Circulation has been established, Go to Event 9.**

Footnote: 1 – MU-V-32: RCP Seal Injection Control Valve

Op Test No.:	1	Scenario #	2	Event #	9	Page	40 of 42
Event Description:	Loss of EG-Y-1B / Station Blackout						

Time	Position	Applicant's Actions or Behavior
BOOTH OPERATOR:		**When directed by the Lead Examiner, INITIATE EVENT 9**
Indications Available:		**EG-Y-1B tripped, Loss of Control Room Lighting, various MAP alarms, Loss of all RCP's.**
	Crew	Diagnoses the loss of EG-Y-1B / Station Blackout
	CRS	Announces reentry into OP-TM-AOP-020, Loss of Station Power
Examiner's Note:		**Steps 3.1 and 3.2 have been previously performed.**
	CRS / ARO	Step 3.3: VERIFY 1D 4160V and 1E 4160V bus are energized. RNO: If neither ES 4160V bus is energized, then GO TO Section 4.0 STATION BLACKOUT.
		Section 4.0 – Station Blackout
Examiner's Note:		**Steps 4.1 and 4.2 are N/A**
CT-3	URO	Step 4.4: PLACE the following in PTL: • IC-P-1A, • IC-P-1B.

Footnotes:
1 – EG-Y-1B: "B" Emergency Diesel Generator
2 – IC-P-1A: "A" Intermediate Closed Cooling Water Pump
3 – IC-P-1B: "B" Intermediate Closed Cooling Water Pump

Op Test No.:	1	Scenario #	2	Event #	9	Page	41 of 42
Event Description:	Loss of EG-Y-1B / Station Blackout						

Time	Position	Applicant's Actions or Behavior
	URO	Step 4.4: ENSURE the following CLOSED: • MU-V-3 • MU-V-20 • MU-V-26
Examiner's Note:		**If the above CT-3 actions are not completed prior to RCP seal temperatures rising above 235F, then give the crew EG-Y-1B back and allow them to restore the 1E 4kV bus.**
Examiner's Note:		**After IC-P-1A / 1B are in Pull to Lock and Seal Injection Isolation Valves are Closed OR the 1E 4kV bus has been restored, scenario may be terminated.**

Follow-up question highest event entered during scenario?

Answer: MS1

- **Loss of all Off-Site and all On-Site AC power to emergency busses for 15 minutes or longer.**

Footnotes:	1 – EG-Y-1B: "B" Emergency Diesel Generator 2 – IC-P-1A: "A" Intermediate Closed Cooling Water Pump 3 – IC-P-1B: "B" Intermediate Closed Cooling Water Pump 4 – MU-V-3: RCS Letdown RB Isolation Valve 5 – MU-V-20: Reactor Coolant Pump Seal Water Isolation 6 – MU-V-26: Reactor Coolant Pump Seal Return RB Isolation

Op Test No.: 1	Scenario # 2	Event # N/A	Page 42 of 42
Event Description:	Effects of Loss of 1D 4160V bus		

Time	Position	Applicant's Actions or Behavior

ATTACHMENT 2
Effects of Loss of 1D 4160V bus

Loss of EF-P-2A
Loss of BS Train A
Loss of RR Train A RR-V-3A, RR-V-4A AH-E-1A
Loss of DH, DC and DR Train A
Loss of SC-P-1C
Loss of SR-P-1A
Loss of NR-P-1A and NR-P-1B-R, NS-P-1A and NS-P-1B-P
Loss of IC-P-1A
Loss of SF-P-1A and AH-E-8A
Loss of CA-P-1A and BAMT heater
Loss FW-V-5A and FW-V-92A
Loss of AH-E-9A
Loss of AH-E-27A
Loss of: AH-E-20A, AH-E-20B, AH-E-26, AH-E-90, AH-E- 91, AH-E-92
Loss of power to "A" ESF ventilation
Loss of "A" side Control Building chiller & ventilation fans
Loss of all Control Building heating

Loss of cooling fans in ESAS cabinets: 1A, 2A, 3A, 4A, 4B, 4C and 4D.
PM-1 transfers to EG-Y-3B PM-2 transfers to EG-Y-3A
Loss of Group 8 Pressurizer heaters ES power supply
A, C, and E Inverters transfer to "A" Battery
Loss of RC-V-1 (Pressurizer spray valve)
Loss of "Grey" plant page phone system
Loss of sample pumps on: RM-A-12 (Primary Lab Air Monitor), RM-A-4, RM-A-6, RM-A-9
1C ES Valves MCC transfers to 1S bus
Loss of MU-P-1A and MU-P-1B-D
Loss of MU-P-2B (MU-P-1B Aux Oil Pump)
Loss of LO-P-5 auto starts LO-P-6
Loss of Relay Room CO_2 Control power
Loss of River Water Chem Treatment Sys.
Loss of Screen House Fire Detection System and ½ of Screen House lighting
Loss of WT-P-33A
Loss of SR-S-2A, SR-S-2C Bar Rakes
Loss of SR-S-3A, SR-S-3C Traveling Screens

Facility:	Three Mile Island	Scenario No.: 4	Op Test No.: 289-2014-301
Examiners:		Operators:	
Initial Conditions:	• (Temporary IC-244)		
	• 85% Power, MOL		
	• I&C Maintenance is occurring on HSPS, Train B, currently testing EF-V-30B.		
	• SBO OOS for Maintenance, expected to return to service in 10 hours.		
	• Crane work is occurring on the West side of the Plant to stage new piping.		
	• NRC Authorization Code for today is AB12.		
Turnover:	Maintain 85% Reactor Power		
Critical Tasks:	• PORV Control for Heat Transfer (CT-13) (If conditions are met)		
	• Shutdown Reactor - ATWS (CT-24)		
	• Restore Feed to a Dry OTSG (CT-26)		

Event No.	Malf. No.	Event Type*	Event Description
1	IA08	TS CRS C ARO	Instrument Air Leak Requiring Isolation of "A" Side 2-Hour Air and "A" EFW Valves, entry into OP-TM-AOP-028 (ARO:Start IA-P-1A/B)
2	IC38B	C CRS C ARO	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation. (ARO: defeats invalid signal, secures EF-P-2B)
3	RD10B	I CRS I URO I ARO	Uncontrolled Inward Rod Motion. (URO: Assumes Manual Control of Control Rods)
4		TS CRS C URO	MU-V-18 Fails Closed, entry into Guide 9. (URO: Controls Pressurizer Level with HPI valve)
5	FW15A	C CRS R URO N ARO	"A" Main Feed Pump Trips, Manual runback required. (URO: Runback in Manual, ARO: Runback in Manual)
6	TH18B	C CRS C URO C ARO	Sheared Shaft on RC-P-1B (URO: Secures RC-P-1B, ARO: re-ratios Main Feedwater)
7	RD28 RD32	M CRS M URO M ARO	"B" Main Feed Pump Runs to 0 rpm, ATWS, Lack of Primary to Secondary Heat Transfer.
8		C CRS C ARO	EFW Control Valves fail to operate, EF-V-52A-D Closed (ARO: Establish PSHT via Condensate Booster Pump flow)
9		C CRS C URO	MU-P-1A/C will not start, MU-P-1B trips. (URO: Establish PORV control for Heat Transfer)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRC Scenario #4

Event #1: When the crew has accepted the watch, the Lead Examiner will cue the Loss of Instrument Air.

The operators will diagnose the Loss of Instrument Air based on a report from the field and slightly lower IA pressure.

Upon a Loss of Instrument Air, the following Critical Safety Functions are affected:

CSF-1, Reactivity & Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. Loss of IA: If IA pressure < 60 psig, then the reactor will be tripped. At above 60 psig, IA will be sufficient for plant control and proper reactivity management. Reactor trip capability is not impacted by loss of IA. Emergency boration can be performed via BWST or by local operation of MU-V-51 when emergency borating from BAMT. Emergency boration via the RBAT is inoperable (several air operated valves w/o handwheel). DC-V-20A & B are closed to prevent flooding new fuel storage area with non-borated water.

CSF-3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. Loss of IA: Normal RCS pressure control (spray & heaters) is not affected by loss of IA. Loss of IA will result in a loss of letdown. This will eventually cause problems with RCS pressure control (i.e., with seal injection and no letdown, pressurizer level will increase until solid ops is required). This is mitigated by providing a method to restore letdown without IA IAW OP-TM-211-950. Emergency pressure control functions (PORV & ES powered heaters) are not affected by loss of IA. Both methods (ICCW to thermal barrier & seal injection) of RCP seal cooling are adversely affected by loss of IA. IC-V-3, IC-V-4, and MU-V-20 fail closed on loss of air (after depletion of local air reservoir). Local operator action to block OPEN IC-V-3, 4, and MU-V-20 is needed to maintain redundant means of seal cooling. Loss of ICCW more than 10 minutes after loss of seal injection, or Loss of Seal Injection for more than 10 minutes without ICCW will result in unacceptable RCP seal & thermal barrier temperatures which will preclude restoration of RCP seal cooling. (Reference 6.1) Therefore, the Loss of IA procedure is designed to ensure that both SI and ICCW are not lost.

CSF-4, Core Heat Removal: Provide the capability to remove core heat production at all times. Loss of IA: With IA pressure > 60 psig, main FW and main turbine (or turbine bypass) operation will not be adversely affected. If IA pressure is < 60 psig, the reactor will be shutdown and normal FW and TBV control will be utilized. If BUIA does maintain these functions, then EFW and ADVs will be used. The safety grade 2 HR air system should maintain the capability for remote control of these functions from the control room. If necessary, local operation of EF-V-30s or MS-V-4s will be utilized. EF-P-1 will start if air to IB is lost. MS-V-13A & B fail open. The pump will remain operating until IA pressure is restored. EF-P-1 remains operable during a loss of IA event. CO-V-13 is closed at less than 60 psig to prevent loss of EFW inventory caused by dumping the CSTs to the hotwell. CO-V-8 and hotwell makeup level control is supplied by BUIA.

CSF-5, Containment Integrity: Provide means to prevent or minimize fission product release to the environment. (1) Maintain containment pressure below design and (2) Provide capability to isolate the containment when required. Loss of IA: Containment cooling. Industrial cooler operation will be degraded. RBEC will be initiated IAW MAP N-1-6 if RB air temperature is high.

The CRS will enter OP-TM-AOP-028, LOSS OF INSTRUMENT AIR. The ARO will start IA-P-1A and/or IA-P-1B from the Control Room prior to Instrument Air reaching 60psig (setpoint below which a manual Reactor Trip must occur). The CRS will determine isolation points and order the appropriate valves to be closed. The CRS will evaluate and declare T.S. 3.4.1.1.a.(2) based on the following Limit/Precaution in 1104-25, Instrument and Control Air System:

> Both "A" and "B" trains of two-hour BUIA must be pressurized and inservice prior to exceeding 250°F in RCS. (Tech. Spec. Definition of OPERABLE (1.3) applied to EFW.)

T.S. 3.4.1.1.a.(2) Three independent Emergency Feedwater (EFW) Pumps and two redundant flowpaths to each Once Through Steam Generator (OTSG) shall be OPERABLE with:

(2) With one EFW Pump or any EFW flowpath inoperable, restore the inoperable pump or flowpath to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 12 hours.

When IA-P-1A and/or IA-P-1B are/is running, the air leak has been isolated and the Tech Spec has been declared, the scenario can continue.

Event #2: The Lead Examiner can cue the Inadvertent Low Level Signal on the “B” OTSG with EFW actuation.

The crew will diagnose the Inadvertent Low Level Signal by EF-P-2B and EF-P-1 running with no valid reason (OTSG level is greater than 10” in the Startup Range and OTSG pressure is greater than 600 psig).

The ARO will respond per OP-TM-424-901, and defeat the HSPS signal, secure the running EFW pump (EF-P-2B), and re-enable HSPS.

When HSPS is re-enabled, the scenario can continue.

Event #3: The Lead Examiner will cue the Uncontrolled Inward Rod Motion. This will cause an ICS transient.

The crew will diagnose the uncontrolled inward rod motion by an inward signal shown on the Diamond panel and the Position Indication Panel, Reactor Power lowering, RCS pressure and temperature lowering.

> *Note: OP-TM-AOP-064, UNCONTROLLED ROD MOTION, was deleted when the Digital Control Rod System was installed, and so the only way to address the situation is with OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET.*

Entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET will be required based on RCS pressure lowering.

> "RCS pressure is not being controlled" requires the operator to make a subjective determination, based on their skills, training, and experience. A determination that RCS pressure is being controlled should include the following elements:
>
> 1) The reason for the transient is understood
> 2) RCS pressure response is consistent with the expected response for the event
> 3) Automatic or manual control in accordance with normal operating procedures is effectively controlling RCS pressure.
>
> A conservative assessment (i.e. concluding that RCS pressure is not being controlled) is appropriate when the three conditions above cannot be satisfied. ICS failures are one class of events that can lead to an upset in primary to secondary heat transfer. Most ICS failures can be mitigated by use of the appropriate manual control normal operating procedures.

This entry into AOP-070 is unique from the other scenarios because Reactor Power will lower due to a rod insertion signal, and not due to a failed ICS input.

Once the plant is stabilized in ICS HAND control, the scenario can continue.

Event #4: The Lead Examiner will cue the Closure of MU-V-18.

The crew will diagnose MU-V-18 closing by the green closed light lit and the red open light not lit (CC), lowering Pressurizer level indications (CC), and if left unattended long enough, MAP G-2-5, Pressurizer Level Hi/Lo in alarm.

The URO will establish Pressurizer Makeup manually via HPI Control Valve, MU-V-16B IAW OP-TM-EOP-010, Guide 9, RCS Inventory Control:

> If normal makeup flow has not been established via MU-V-17 or MU-V-217 and through MU-V-18 (i.e. MU24-FI < 20 GPM), then MU-V-16B (or MU-V-16D) is used for normal MU flow. MU-V-16D is only used when the MU discharge cross connects are not in the normal lineup.

The CRS will evaluate and declare T.S. 3.5.7:

> 3.5.7 REMOTE SHUTDOWN SYSTEM
> The minimum number of functions identified in Table 3.5-4 shall be OPERABLE. With the number of functions less than the minimum required, restore the required function to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within an additional 12 hours.

TABLE 3.5-4
REMOTE SHUTDOWN SYSTEM INSTRUMENTATION AND CONTROLS

Function/Instrument or Control Parameter	Required Number of Functions
MU-V-18	1

Once Pressurizer level is being restored, Makeup is being controlled manually, and the Tech Spec call has been declared, the scenario can continue.

Event #5: The Lead Examiner will cue the Loss of the "A" Main Feedwater Pump.

The crew will diagnose the Loss of FW-P-1A by an immediate drop in Feedwater flow, OTSG level decreasing rapidly, steam header pressure increasing, a neutron cross-limit alarm coming in, and the remaining feedwater pump speed increases causing feedwater flow to recover somewhat.

OP-TM-MAP-H0101, Plant Runback, will be entered and a manual runback will be performed to lower Reactor Power to approximately 68%. this will require coordination between the URO and ARO, ensuring that the Control Rods and Feedwater are run back in symphony. This is the reactivity manipulation for the scenario.

Once sufficient reactivity manipulation has been observed, the scenario can continue.

Event #6: The Lead Examiner will cue the Sheared Shaft on RC-P-1B.

The crew will diagnose the sheared shaft on RC-P-1B by MAP alarm F-3-1 in alarm and zero amps indicated on RC-P-1B.

OP-TM-MAP-F0301, RC LOOP FLOW LO, and OP-TM-226-152, Shutdown RC-P-1B, will be entered to secure RC-P-1B and to re-ratio Main Feedwater.

The URO will secure RC-P-1B and the ARO will re-ratio Main Feedwater due to the "A" and "B" Feed flow master ICS control stations being in HAND.

Once sufficient reactivity manipulation has been observed, the scenario can continue.

Event #7/8/9: The Lead Examiner will cue the "B" Main Feed Pump Lowering to 0 rpm. The crew will diagnose the loss of Main Feedwater by an immediate drop in Feedwater flow, OTSG level decreasing rapidly, and a rapid rise inn RCS pressure and temperature. The URO will identify that an ATWS has occurred and will perform the Immediate Manual Actions of OP-TM-EOP-001, REACTOR TRIP.

Memorized operator action is appropriate because operator response time can significantly alter the consequences of an ATWS or a failure of the turbine to trip when required.

The reactor protection system is designed to prevent fuel clad or RCS pressure boundary failure. If RCS conditions are outside of the RPS envelope and RPS fails to de-energize the control rod drive mechanisms, prompt operator response can minimize the potential for fuel damage or an RCS pressure boundary failure

EOP-001 is the primary entry point to the EOP network. This procedure is designed to address or direct procedures to address events from a reactor trip with no adverse plant conditions or equipment failures as well as events which challenge the fission product barriers.

The first priority (with the exception of entry into OP-TM-EOP-005 at power to mitigate an OTSG tube leak) to mitigate the consequences of a significant plant upset is to ensure the reactor is shutdown. Success of all subsequent EOP action is based on reducing core heat generation to reactor decay heat generation rates.

– Once the reactor is shutdown, prompt isolation of the turbine steam flow path is significant. Until the major steam flow path through the turbine to the condenser is isolated, RCS heat removal will be much larger than heat generation, and a rapid RCS cooldown will continue.

– When the turbine steam flow path is isolated, plant conditions are evaluated to determine if any symptoms of a core cooling upset are present.

Based on a symptom of low subcooling margin, excessive heat transfer, lack of primary to secondary heat transfer or primary to secondary leakage, rule based actions and entry into other sections of the EOP network is performed.

The crew will identify a Lack of Heat Transfer based on the following definition from OS-24, Conduct of Operations During Abnormal and Emergency Events:

> LOHT is the inability of either OTSG to remove sensible heat from the RCS.
>
> LOHT can be confirmed if one of the following sets of conditions exists:
> - Incore temperatures or Thot rising above 580°F and at least one RC Pump operating
> - Incore temperatures rising and NO FEEDWATER available
> - Incore temperatures rising and RCS circulation can not be confirmed

The CRS will direct entry into OP-TM-EOP-004, LACK OF PRIMARY TO SECONDARY HEAT TRANSFER.

RCP philosophy IAW the GEOG and the OP-TM-EOP-004 Basis Document:

> One or two RCPs (one in each loop) should be left running to reduce heat input to the RCS yet provide for heat transfer as soon as FW is restored to either OTSG.
>
> The step intent is to reduce heat input to the RCS while maintaining forced flow in both RC loops.
>
> Impact to pressurizer spray flow should be considered when selecting RCPs for shutdown.

Although one RCP is allowed, our procedure directs one RCP in each loop to allow for even flow between the loops (avoiding the reverse directional flow in the opposite loop), and to prevent a loss of forced RCS flow if the only running RCP were to trip.

The ARO will recognize that EFW control valves are inoperable and report that feedwater is not available.

> If feedwater is NOT available, then efforts to establish EFW should continue. If this event occurs when the condensate booster pumps could provide a continuous feedwater supply, then the booster pumps may be used alone to feed the OTSGs.
>
> HPI COOLING will be initiated (EOP-009) when RCS pressure approaches the PORV setpoint. After initiating HPI COOLING, actions to restore feedwater (main or emergency) should continue.

Additionally, when the conditions are met during the scenario the CRS will direct entry into OP-TM-EOP-009, HPI COOLING.

HPI will not be adequate, which will force the URO to manually control the PORV to maintain RCS pressure while minimizing inventory losses until Primary to Secondary Heat Transfer exists.

A report from the field will inform the control room that EF-V-52A-D are closed. These valves are the downstream isolations to the EF-V-30A-D, Emergency Feedwater Flow Control Valves. The Auxiliary Operator will be directed to open the EF-V-52A-D valves and report that only the EF-V-52D will open. EF-V-52D will be opened and the ARO will feed the "A" OTSG IAW OP-TM-EOP-010 Guide 13, Feeding a Dry or Depressurized OTSG.

Termination: The scenario can be terminated when the Reactor is shutdown, and Primary to Secondary Heat Transfer has been established with Emergency Feedwater.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-13 – PORV Control for Heat Transfer – During action to restore primary to secondary heat transfer, RCS pressure must be continually controlled. RCS pressure is controlled by manually opening and closing the PORV. This prevents excessive PORV cycling which could occur if the PORV were allowed to operate automatically.

During mitigation of LHT, manually cycle the PORV as necessary to maintain RCS pressure between the PORV setpoint or RV P-T limit and minimum SCM (if subcooled) or 1600 PSIG (if saturated).

- Performing PORV Control for Heat Transfer outside of the following limit should be considered **grounds for failure of the critical task:**
  - PORV automatically lifts three (3) times.

Safety Significance: During mitigation of LHT the PORV should be manually cycled to control RCS pressure between the PORV setpoint or RV P-T limit and 1600 PSIG if the RC is saturated or minimum allowable SCM if the RC is subcooled. The PORV opening values prevent challenges to the pressurizer safety valves and the RV P-T limit while the PORV closing values maintain a positive primary to secondary side AT (SGs remain heat sinks).

Cues:
1. High RCS pressure alarm
2. SCM monitor and associated alarms
3. SPDS displays and associated alarms
4. P-T display and associated alarms
5. Verbal alert by plant staff that RCS pressure has reached the PORV setpoint

Performance Indicators:
1. Operation of PORV and PORV block valve controls

Feedback:
1. PORV and PORV block valve status indication
2. RCS pressure and temperature
3. Verbal indication by plant staff that PORV flow has been initiated

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-24 – Shutdown Reactor - ATWS – Actuation of the manual reactor trip pushbutton, to backup the automatic trip and/or provide the necessary reactor trip, anytime the reactor trips or should have tripped. In the event the reactor fails to trip, in response to automatic and manual demands, then perform the following: Deenergize CRDMs

- Shutting down the reactor due to an ATWS outside of the following limit should be considered **grounds for failure of the critical task:**
    - Not deenergizing the CRDM power supplies:
        - 1G-02
        - 1L-02

Safety Significance: Without taking the proper actions, there exists a potential challenge to the Reactor Coolant System pressure boundary due to high RCS pressure.

An ATWS could occur due to a failure of the RPS to initiate a reactor trip signal upon one of the reactor trip parameters reaching its trip limit or the control and safety rods failing to insert once the RPS trip signal is given automatically or manually. A Diverse Scram System (DSS) is provided, independent of the RPS, to minimize the potential for an ATWS event. However, the operator must recognize and react to any of the reactor trip parameters that exceeds its limit but does not cause a reactor trip.

In this situation, the manual reactor trip button has been actuated but reactor power is not less than the plant specific reactor power level for verification of a reactor trip. Therefore, the reactor has not been shut down and there has been a failure of all or most of the control and safety rods to insert into the reactor core. Given that RPS, DSS and the manual reactor trip have failed to trip the reactor, then immediate actions to shut down the reactor by the alternate methods should be initiated. These methods include trip of CRDM breakers and maximum rate of boron addition to the RCS. Once the control and safety rods are successfully tripped into the core, or sufficient boric acid has been added to provide an adequate shutdown margin, the reactor will be shut down.

This should be achieved prior to taking additional mitigating actions because post-trip transient mitigation, from this point forward, is based on the assumption that the reactor is shutdown (subcritical).

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-24 – Shutdown Reactor - ATWS – Continued

Cues:

1. RPS channel alarms
2. RCS Power, Pressure and Temperature indications
3. P-T display and associated alarms
4. Verbal alert by plant staff that reactor shutdown requirements have not been met

Performance Indicators:

1. Operation of control rod drive feeder breakers

Feedback:

1. Nuclear Instruments
2. Control rod status indication
3. Control rod drive breaker status indication
4. Verbal indication from plant staff of reactor shutdown status

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-26 – Restore Feed to a Dry OTSG - If a RCP is running, establish FW to the SG(s) and control FW flow to maintain RCS cooldown rate within limits. EFW flow is established at less than 450 GPM total flow and MFW flow is established at less than 200,000 LBM/HR total flow.

- Restoring Feed to a Dry OTSG (sustained) outside of the following limits should be considered **grounds for failure of the critical task:**
    - To minimize OTSG stress, do not exceed MFW flow greater than than 200,000 LBM/HR total flow (sustained).
    - To ensure the main feedwater nozzles remain full and to prevent cavitation type damage to the Main Feedwater nozzles if they are not full of subcooled fluid, do not fall below less than 160,000 LBM/HR total flow (sustained).

Safety Significance:
If it is decided to perform the cooldown by using trickle feeding, it will be necessary to control the rate of FW addition to the SGs to maintain RCS cooldown limits. The FW flow rate should be adjusted to get the desired cooldown rate. If possible EFW should be used to limit SG thermal stresses. If MFW is used with the MFW nozzles, it will only be effective with forced flow.

Once heat transfer is restored in the SG, feed rates can be adjusted as necessary to control the cooldown and SG tube-to-shell ΔT.

Cues:
1. Low SG level alarms
2. Low SG pressure alarms
3. Verbal alert by plant staff that no SG is available for heat transfer

Performance Indicators:
1. Operation of EFW/MFW pump controls
2. Operation of EFW/MFW valve controls

Feedback:
1. EFW/MFW flow
2. SG level and pressure
3. RCS pressure and temperature
4. Verbal alert by plant staff of EFW/MFW flow status

Industry Experience:

- FW-P-1A Coupling Failure (TMI CR-00189457)
- Harris Nuclear Plant Manual Scram Due to Loss of Feedwater (12/14/99)
- Oconee 1 Loss of Feedwater (5/26/00)

PRA

- Feedwater Transient (Initiating Event)

Event	Description	Procedure Support
	Initial Set-up	85% Power, MOL
1	Instrument Air Leak Requiring Isolation of "A" Side 2-Hour Air	OP-TM-AOP-028, LOSS OF INSTRUMENT AIR
		T.S. 3.4.1.1.a.(2)
2	Invalid "B" OTSG Low Level (TS), "B" EFW actuation	OP-TM-424-901, Emergency Feedwater
3	Uncontrolled Inward Rod Motion	OP-TM-AOP-070, Primary to Secondary Heat Transfer Upset
		1102-4, Power Operations
4	MU-V-18 Fails Closed	OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
		T.S. 3.5.7
5	"A" Main Feed Pump Trips, Manual runback required	OP-TM-MAP-H0101, Plant Runback
		OP-TM-621-471, ICS Manual Control
6	Sheared Shaft on RC-P-1B	OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer
7	"B" Main Feed Pump Runs to 0 rpm, ATWS, Lack of Primary to Secondary Heat Transfer	OP-TM-EOP-001, Reactor Trip
		OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
		OS-24, Conduct of Operations During Abnormal and Emergency Events
8	EFW Control Valves fail to operate, EF-V-52D	OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
9	MU-P-1A/C will not start, MU-P-1B trips	OP-TM-EOP-009, HPI Cooling

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-238	85% HFP ICS full AUTO	Equilibrium XENON
Malfunction RD28	Value: Insert When: Immediately	ATWS Scenario Support
Malfunction RD32	Value: Insert When: Immediately	ATWS Scenario Support
Malfunction MU31C	Value: Insert When: Immediately	MU-P-1A will not start
Malfunction MU34C	Value: Insert When: Immediately	MU-P-1C will not start
Remote IAR01	Value: Off When: Immediately	Loss of Instrument Air Scenario Support
Remote IAR02	Value: Off When: Immediately	Loss of Instrument Air Scenario Support
Remote IAR03	Value: Off When: Immediately	Loss of Instrument Air Scenario Support
Remote IAR04	Value: Off When: Immediately	Loss of Instrument Air Scenario Support
Remote FWR54	Value: MAN When: Immediately	EF-V-30A Local Control
Remote FWR55	Value: 0 When: Immediately	EF-V-30A Control Set to 0
Remote FWR58	Value: MAN When: Immediately	EF-V-30C Local Control
Remote FWR59	Value: 0 When: Immediately	EF-V-30C Control Set to 0
Remote FWR56	Value: MAN When: Immediately	EF-V-30B Local Control
Remote FWR57	Value: 50 When: Immediately	EF-V-30B Control Set to 0
Malfunction IA08	Value: Severity 50 When: EVENT 1	Loss of Instrument Air
Malfunction IC38B	Value: Insert When: EVENT 2	Invalid "B" OTSG Low Level, "B" EFW actuation
Annunciator J-1-4	Value: ON When: EVENT 2	OTSG "B" EFW Actuated
Malfunction RD10B	Value: Insert When: EVENT 3	Uncontrolled Inward Rod Motion
Override ZDIPBCMUV18	Value: On When: EVENT 4	MU-V-18 Fails Closed

ACTION	COMMENTS / INSTRUCTIONS		DESCRIPTION
Malfunction FW15A	Value: When:	On EVENT 5	FW-P-1A Trips
Malfunction TH18B	Value: When:	On EVENT 6	RC-P-1B Sheared Shaft
Override ZDIMSCB(1)	Value: When:	ON EVENT 7	FW-P-1B Runs to 0 RPM
Override ZDIICS36BMCS(1)	Value: When:	OFF EVENT 7	FW-P-1B Runs to 0 RPM
Override ZDIICS36BMCS(2)	Value: When:	ON EVENT 7	FW-P-1B Runs to 0 RPM
Override ZDIICS36BMCS(3)	Value: When:	OFF EVENT 7	FW-P-1B Runs to 0 RPM
Override ZDIICS36BMCS(4)	Value: When:	OFF EVENT 7	FW-P-1B Runs to 0 RPM
Override ZLOICS36BMCS(1)	Value: When:	ON EVENT 7	FW-P-1B Runs to 0 RPM
Override ZLOICS36BMCS(2)	Value: When:	OFF EVENT 7	FW-P-1B Runs to 0 RPM
Trigger 9	Value: When:	Insert dhndhp1a > 0.9	Triggers MU-P-1B Trip
Trigger 10	Value: When:	mrf FWR57 0 Ratpw<20	Triggers EF-V-30 Failures
Remote FWR60	Value: When:	MAN EVENT 10	EF-V-30D Local Control
Remote FWR61	Value: When:	0 EVENT 10	EF-V-30D Control Set to 0
Malfunction MU33A	Value: When: Delay:	INSERT EVENT 9 10 SECONDS	MU-P-1B trips
Trigger 20	Value: When:	DMF IA08 EVENT 20	Isolates Air Leak

Op Test No.:	1	Scenario #	4	Event #	1	Page	17 of 51
Event Description:	Instrument Air Leak isolating "A" 2-Hour Air.						

Time	Position	Applicant's Actions or Behavior
Booth Operator:		**When directed by the Lead Examiner: Initiate Event 1**
Indications Available:		**Lowering Instrument Air Pressure (PL), verbal report from the field, IA-P-1A and IA-P-1B may start.**
Booth Cue:		**Report, as an Auxiliary Operator, that "I'm by the "A" 2-Hour Air bank and it looks like there is a small Instrument Air leak downstream of IA-V-1626A. The "A" 2-Hour Air bank pressure is 1000psig and lowering quickly."**
Booth Cue:		**If contacted as I&C to suspend maintenance, acknowledge and state that you are backing out to a safe condition.**
	Crew	Diagnoses the Loss of Instrument Air.
	CRS	Direct entry into OP-TM-AOP-028, Loss of Instrument Air.
		OP-TM-AOP-028, Loss of Instrument Air
	ARO	Step 3.1: ANNOUNCE loss of instrument air over plant page and radio.
	N/A	Step 3.2: IAAT IA pressure is < 60 psig (PI-222 or PI-1403), then PERFORM the following:
Booth Cue:		**If asked, IA-PI-491 Reads 80 psig.**

Footnotes: 1 – IA-P-1A/1B: Instrument Air Compressors.
2 – IA-V-1626A: "A" 2 Hour Air Distribution Supply Valve.
3 – IA-PI-222: Instrument Air Pressure Indicator.
4 – IA-PI-1403: Turbine Building Instrument Air Pressure Indicator.
5 – IA-PI-491: Instrument Air Dryer Inlet Pressure.

Op Test No.:	1	Scenario #	4	Event #	1	Page	18	of	51
Event Description:		Instrument Air Leak isolating "A" 2-Hour Air.							

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.3: If IA-PI-491 (IB 295: upstream of pre-filters) < 85 psig and IA-P-1A and IA-P-1B are not loaded, then START IA-P-1A or 1B from the Control Room by rotating the control switch for either pump (PL) clockwise, verifying the red light is lit, and the green light is not lit.
Examiner's Note:		**Steps 3.4 through 3.11 are N/A.**
	CRS	Step 3.12: When cause of loss of IA is known, then CONTINUE in this procedure.
Examiner's Note:		**Step 3.13 is N/A.**
Booth Cue:		**If asked, IA-P-1A/B filter and dryer DP reads 10 psid. (Δ of IA-PI-491 and IA-PI-493)**
Booth Cue:		**If asked, IA-P-4 filter and dryer DP reads 10 psid. (Δ of IA-PI-1408 and IA-PI-1411)**
	CRS	Step 3.14: VERIFY loss of Instrument Air was due to system leak.
	CRS	Step 3.15: DETERMINE leak isolation requirements and possible effects.
	CRS	Step 3.16: ISOLATE leak.

Footnotes: 1 – IA-P-1A/1B: Instrument Air Compressors.
2 – IA-PI-491: Instrument Air Dryer Inlet Pressure.
3 – IA-PI-493: Instrument Air Dryer Outlet Pressure.
4 – IA-PI-1408: IA-P-4 Dryer Inlet Pressure.
5 – IA-PI-1411: IA-P-4 Dryer Outlet Pressure.
6 – IA-P-4: Main Instrument Air Compressor.

Op Test No.: 1	Scenario # 4	Event # 2	Page 19 of 51
Event Description:	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation.		

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**The minimum valves for isolation, as identified on drawing 302-273 (applicable portion can be found on Page 51 of this scenario), are as follows:** • **IA-V-1629A**
Booth Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to isolate the air leak (and the proper valves have been identified), then Insert Event 20, ensure that malfunction IA08 has been deleted and report that "the air leak has been isolated".**
	CRS	Declare TS for the 2-Hour Air portion of "A" side EFW being non-operational.
Examiner's Note:		**T.S. 3.4.1.1.a.(2) Three independent Emergency Feedwater (EFW) Pumps and two redundant flowpaths to each Once Through Steam Generator (OTSG) shall be OPERABLE with: (2) With one EFW Pump or any EFW flowpath inoperable, restore the inoperable pump or flowpath to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 12 hours.**
Examiner's Note:		**Once the air leak has been isolated and the TS call is made, Go to Event 2.**

Footnotes: 1 – IA-P-1A/1B: Instrument Air Compressors.
2 – IA-V-1616A: "A" 2 Hour Air Bank Header Isolation Valve.
3 – IA-V-1629A: Normal Instrument Air to "A" 2 Hour Air Distribution Isolation Valve.

Op Test No.:	1	Scenario #	4	Event #	2	Page	20 of 51
Event Description:	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation.						

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the Lead Examiner: Initiate Event 2.		
Indications Available: "B" OTSG Low Level alarm clears, EF-P-2B indicates running, MAP-J-1-4 in Alarm		
	Crew	Diagnosis inadvertent EFW actuation, "B" side.
	CRS	Directs entry into OP-TM-424-901, Emergency Feedwater.
Booth Note:		**Before the next message is delivered, ensure that Malfunction IC38B and Annunciator J-1-4 are removed.**
Booth Cue:		**When contacted as I&C, state "A switch was bumped during maintenance. All switches have been inspected and are in their normal position. Maintenance has been suspended".**
		OP-TM-424-901, Emergency Feedwater
	INFO	Step 4.1.1: If EFW actuation was caused by an invalid signal or condition, then GO TO section 5.
	ARO	Step 5.1: Obtain CRS concurrence to shutdown EFW.
	N/A	Step 5.2: If incore temperature <200F then GO TO step 5.5.
	INFO	Step 5.3: When all of the following conditions exist: ▪ SCM > 25°F. ▪ Main Feedwater flow is available to each OTSG AVAILABLE. ▪ At least one reactor coolant pump is operating. ▪ OTSG level >20" in each available OTSG. ▪ RB pressure < 2 psig. then Continue.

Footnote: 1 – EF-P-2B: Emergency Feedwater Pump "B"

Op Test No.:	1	Scenario #	4	Event #	2	Page	21 of 51
Event Description:	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation.						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 5.3.1: Place the EFW control valves in Manual: ▪ EF-V-30A by pressing the Manual pushbutton (CL), verifying the Manual light is lit, and the Auto light is not lit. ▪ EF-V-30B by pressing the Manual pushbutton (CC), verifying the Manual light is lit, and the Auto light is not lit. ▪ EF-V-30C by pressing the Manual pushbutton (CC), verifying the Manual light is lit, and the Auto light is not lit. ▪ EF-V-30D by pressing the Manual pushbutton (CL), verifying the Manual light is lit, and the Auto light is not lit.
	ARO	Step 5.3.2: Ensure all EFW actuation switches (8) are in DEFEAT by rotating the 8 EFW actuation switches counterclockwise to the DEFEAT position.
	N/A	Step 5.3.3: Close both EF-V-30A and EF-V-30D by adjusting the toggle switches (CL) in the closed direction. ARO may pin the toggle switches in the full closed position.
	ARO	Step 5.3.4: If OTSG A is available, then ensure level is maintained with Main Feedwater.
	N/A	Step 5.3.5: Close both EF-V-30B and EF-V-30C by adjusting the toggle switches (CC) in the closed direction. ARO may pin the toggle switches in the full closed position.

Footnotes: 1 – EF-V-30A: EFW Control Valve to "A" OTSG
2 – EF-V-30B: EFW Control Valve to "B" OTSG
3 – EF-V-30C: EFW Control Valve to "B" OTSG
4 – EF-V-30D: EFW Control Valve to "A" OTSG

Op Test No.:	1	Scenario #	4	Event #	2	Page	22 of 51
Event Description:	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation.						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 5.3.6: If OTSG B is available, then ensure level is maintained with Main Feedwater.
	ARO	Step 5.3.7: Place Loss of RCPs and High RB Pressure in ENABLE as follows: ▪ Train A Loss of RCPs in ENABLE by rotating the switch (CL) clockwise to the ENABLE position. ▪ Train B Loss of RCPs in ENABLE by rotating the switch (CC) clockwise to the ENABLE position. ▪ Train A High RB Pressure in ENABLE by rotating the switch (CL) clockwise to the ENABLE position. ▪ Train B High RB Pressure in ENABLE by rotating the switch (CC) clockwise to the ENABLE position.
	ARO	Step 5.3.8: If at least one MFW pump is reset, then place Loss of FWPs in ENABLE as follows: ▪ Train A Loss of FW Pumps in ENABLE by rotating the switch (CL) clockwise to the ENABLE position. ▪ Train B Loss of FW Pumps in ENABLE by rotating the switch (CC) clockwise to the ENABLE position.
	ARO	Step 5.3.9: If OTSG A level > 20 inches and OTSG B level > 20 inches then place Lo-Lo OTSG Level in ENABLE as follows: ▪ Train A Lo-Lo OTSG Level in ENABLE by rotating the switch (CL) clockwise to the ENABLE position. ▪ Train B Lo-Lo OTSG Level in ENABLE by rotating the switch (CC) clockwise to the ENABLE position.
	ARO	Step 5.3.11: Place EF-P-2B in Normal-After-Stop by rotating the Control Switch (CL) counter-clockwise, verifying the green light is lit, the red light is not lit, and amps indicate zero.

Footnote: 1 – EF-P-2B: Emergency Feedwater Pump "B"

Op Test No.:	1	Scenario #	4	Event #	2	Page	23	of 51
Event Description:	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation.							

Time	Position	Applicant's Actions or Behavior
	N/A	Step 5.3.12: CLOSE AS-V-4
	ARO	Step 5.3.13: ENSURE MS-V-10A is Closed.
	ARO	Step 5.3.14: CLOSE MS-V-13A by pressing the close pushbutton, verifying the green closed pushbutton is lit, red open pushbutton is not lit.
	ARO	Step 5.3.15: ENSURE MS-V-10B is Closed.
Examiner's Note:		**MS-V-13B is on a forty second delayed timer to open (to avoid the over-speeding of EF-P-1.** **During validation, the faulted signal was removed prior to MS-V-13B opening, therefore it was not applicable.** **The following step would be applicable if MS-V-13B has gone open.**
	N/A	Step 5.3.16: Close MS-V-13B.

Footnotes: 1 – AS-V-4: Auxiliary Steam Supply Valve to EF-P-1
2 – MS-V-10A: "A" OTSG to EF-P-1 Throttle Valve.
3 – MS-V-10B: "B" OTSG to EF-P-1 Throttle Valve.
4 – EF-P-1: Steam Driven Emergency Feedwater Pump.
5 – MS-V-13A: "A" OTSG to EF-P-1 Main Steam Supply Valve.
6 – MS-V-13B: "B" OTSG to EF-P-1 Main Steam Supply Valve.

Op Test No.:	1	Scenario #	4	Event #	2	Page	24 of 51
Event Description:	Invalid "B" OTSG Low Level, "B" EFW inadvertent actuation.						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 5.3.17: Place each of the following EFW control valves in AUTO and select REMOTE setpoint: • EF-V-30A by pressing the Auto pushbutton (CL), verifying the Auto light is lit, and the Manual light is not lit. • EF-V-30B by pressing the Auto pushbutton (CC), verifying the Auto light is lit, and the Manual light is not lit. • EF-V-30C by pressing the Auto pushbutton (CC), verifying the Auto light is lit, and the Manual light is not lit. • EF-V-30D by pressing the Auto pushbutton (CL), verifying the Auto light is lit, and the Manual light is not lit.
Examiner's Note:		**After EF-V-30's have been placed in AUTO control, GO TO Event 3.**

Footnotes: 1 – EF-V-30A: EFW Control Valve to "A" OTSG
2 – EF-V-30B: EFW Control Valve to "B" OTSG
3 – EF-V-30C: EFW Control Valve to "B" OTSG
4 – EF-V-30D: EFW Control Valve to "A" OTSG

Op Test No.:	1	Scenario #	4	Event #	3	Page	25 of 51
Event Description:	Uncontrolled Inward Rod Motion.						

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the Lead Examiner: Initiate Event 3.		
Indications Available: Rods indicating inward motion on the Position Indication Panel and the Diamond station, a rapid lowering of RCS pressure, Reactor Power lowering, and changes in indications at multiple ICS stations.		
Examiner's Note: The crew may elect to place the SG/Rx Demand Station to Hand IAW OP-TM-621-471.		
	Crew	Diagnoses uncontrolled inward rod motion.
	CRS	DIRECTS entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	URO	Step 2.1 (**IMA**): Places the Diamond Station in Manual by pressing the Manual/Auto pushbutton on the Diamond Panel and observing the Manual light is lit and the Auto light is not lit (CC).
	URO/ARO	Step 2.2 (**IMA**): Places SG "A" FW Demand and SG "B" FW Demand ICS Stations in HAND by pressing the HAND pushbuttons on each ICS Station and verifying the white HAND lights are lit and the red AUTO lights are not lit on the selected ICS stations (CC).
	URO	Step 2.3 (**IMA**): Verifies Turbine Header Pressure is between 835 and 935 psig as read on the Turbine Header Pressure digital indication (CL)

Op Test No.:	1	Scenario #	4	Event #	3	Page	26 of 51
Event Description:	Uncontrolled Inward Rod Motion.						

Time	Position	Applicant's Actions or Behavior
	URO	Step 2.4 (**IMA**): Verifies RCS Pressure is lowering and/or less than 2205 PSIG by observing RCS pressure meters (CC and PC). As required, if RCS Pressure is >2205 psig, URO places RC-V-1 control in Manual (CC), opens RC-V-1 fully by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC), and then places RC-V-1 control back to AUTO.
Examiner's Note:		**OP-TM-AOP-070, steps 3.1 and 3.2 are IAAT's that should not be applicable during this Event.**
	CRS	Step 3.3: Verifies the Main Turbine is reset by observing it on-line (CL).
	CRS	Step 3.4: Assigns manual control responsibilities and control bands as follows:
	URO	Step 3.4: INSERT or WITHDRAW rods to maintain Reactor power within 1% of current power level by operating the Control Rod switch on the Diamond Panel as applicable (CC).
	ARO	Step 3.4: Adjust FW Flow to maintain Tavg within 2 °F of current temperature by adjusting SG "A" FW Demand and SG "B" FW Demand ICS Station toggle switches as applicable (CL and CC).

Footnotes: 1 – RC-V-1: Pressurizer Spray Control Valve.
2 – FW-V-16A: "A" Main Feedwater Startup Control Valve.
3 – FW-V-16B: "B" Main Feedwater Startup Control Valve.
4 – FW-V-17A: "A" Main Feedwater Control Valve.
5 – FW-V-17B: "B" Main Feedwater Control Valve.

Op Test No.:	1	Scenario #	4	Event #	3	Page	27 of 51
Event Description:	Uncontrolled Inward Rod Motion.						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.4: Maintain Turbine Hdr Pressure within 10 psig of current pressure by adjusting Turbine Load Set Station demand as applicable (CC).
	CRS	Step 3.5: Initiates 1102-4, Power Operations.
	URO	Step 3.6: Ensures SG/Reactor Demand Station is in HAND by pressing the HAND pushbutton and observing white HAND light is lit and red AUTO light is not lit.
	URO	Step 3.6: Ensures Reactor Demand Station is in HAND by pressing the HAND pushbutton and observing white HAND light is lit and red AUTO light is not lit.
	URO	Step 3.6: Ensures SG A/B Load Ratio Demand Station is in HAND by pressing the HAND pushbutton and observing white HAND light is lit and red AUTO light is not lit.
	URO	Step 3.6: Observes that the ULD ICS Station is already in HAND by the white HAND light being lit.
Examiner's Note:		**If Reactor Power is not greater than 75%, then the Feedwater Pumps will be placed in HAND IAW OP-TM-401-472 (473), "Manual Control of FW-P-1A (B)", per Step 3.7 RNO.**
	CRS	Step 3.7: Verifies that MFW Pumps are controlling FW Valve dP greater than 30 psid (CL) and that Reactor Power is greater than 75% (CC).

Footnotes: 1 – FW-P-1A: "A" Main Feedwater Pump.
2 – FW-P-1B: "B" Main Feedwater Pump.

Op Test No.:	1	Scenario #	4	Event #	3	Page	28 of 51
Event Description:	Uncontrolled Inward Rod Motion.						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**OP-TM-AOP-070, step 3.8 is N/A and 3.9 has already been verified.**
	ARO	Step 3.10: Maintains RCS pressure between 2105 and 2205 psig by adjusting SG "A" FW Demand and SG "B" FW Demand ICS Station toggle switches as applicable as applicable (CL and CC).
	ARO	Step 3.11: Maintains RCS Tavg 578 to 580 °F, and controls RCS ΔTc < 5° F by adjusting SG "A" FW Demand and SG "B" FW Demand ICS Station toggle switches as applicable as applicable (CL and CC).
Examiner's Note:		**OP-TM-AOP-070, steps 3.12 and 3.13 are N/A.**
Examiner's Note:		**Once the appropriate stations from OP-TM-AOP-070 have been placed in HAND and the plant is stable, Go to Event 4.**

Footnotes: 1 – FW-V-16A: "A" Main Feedwater Startup Control Valve.
2 – FW-V-16B: "B" Main Feedwater Startup Control Valve.
3 – FW-V-17A: "A" Main Feedwater Control Valve.
4 – FW-V-17B: "B" Main Feedwater Control Valve.

Op Test No.:	1	Scenario #	4	Event #	4	Page	29 of 51
Event Description:	MU-V-18 Fails Closed						

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the Lead Examiner: Initiate Event 4.		
Indications Available:		**Lowering level on Pressurizer indicators (CC), MAP G-0205 in alarm (if Pressurizer level falls to 200"), green closed light lit on MU-V-18 (CC).**
	Crew	Diagnoses MU-V-18 closed.
Examiner's Note:		**The CRS may enter alarm response based on "approaching" criteria, as described in OS-24:** **3.2 APPROACHING:** **The parameter is trending toward the setpoint or limit, and based on its trend and plant conditions it is likely that the parameter will reach the setpoint or limit.** **4.1.14 Guidance on using APPROACHING** **A. If it is clear that the plant trend is going to reach a setpoint requiring action, Shift Management may elect to perform the action before the setpoint is reached. This applies to EOP and AOP entry, safety system actuation, and the performance of emergency response procedure steps.**
	CRS	Directs entry into OP-TM-MAP-G0205, PZR LEVEL HI/LO
Examiner's Note:		**Step 4.1 is N/A.**
		OP-TM-MAP-G0205, PZR LEVEL HI/LO
	CRS	Step 4.2: If PZR level cannot be restored with automatic or manual control of MU-V-17, then INITIATE OP-TM-EOP-010, Guide 9.

Footnotes: 1 – MU-V-17: Normal Makeup to RCS Control Valve.
2 – MU-V-18: Normal Makeup RB Isolation Valve.

Op Test No.: 1	Scenario #	4	Event #	4	Page	30	of 51
Event Description:	MU-V-18 Fails Closed						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**Sections A and B are N/A.**
		OP-TM-EOP-010, Guide 9, RCS Inventory Control
	URO	Step C.1: Verifies MU-P-1B is operating by observing red light lit, green light not lit, and amps in the green band of the ammeter (CC).
	URO	Step C.2: Ensures MU-V-5 is Closed by placing the MU-V-5 Bailey Controller toggle switch in the downward direction until the MU-V-5 indication is at zero (CC).
Examiner's Note:		**Steps C.3 through C.5 are either not possible to accomplish (e.g. Open MU-V-18) or will be ineffective due to MU-V-18 being closed.**
Examiner's Note:		**The URO will not use MU-V-16D to ensure makeup flow due to valve lineup within the Makeup System. MU-V-16D is a component in the "B" HPI Train and there is no associated pump running and no discharge path lined up for flow to get to the Pressurizer. The URO will therefore be required to throttle MU-V-16B.**
	URO	Step C.6 RNO: Throttles MU-V-16B by pressing the red open pushbutton, green close pushbutton, and white stop pushbutton associated with MU-V-16B (CC) as necessary to ensure proper makeup flow, as indicated on the HPI flow indicator for MU-V-16B. (CC).

Footnotes: 1 – MU-P-1B: "B" Makeup Pump
2 – MU-V-5: Letdown Flow Control Bypass Valve.
3 – MU-V-18: Normal Makeup RB Isolation Valve.
4 – MU-V-16B: HPI Control Valve B.
5 – MU-V-16D: HPI Control Valve D.

Op Test No.:	1	Scenario #	4	Event #	4	Page	31 of 51
Event Description:	MU-V-18 Fails Closed						

Time	Position	Applicant's Actions or Behavior
	URO	Step C.7 and C.8: Verify PZR level is being restored by observing rising level on Pressurizer level indicators (CC) and/or the PPC.
	CRS	Identifies and declares Tech Spec 3.5.7.

Examiner's Note: T.S. 3.5.7:

3.5.7 REMOTE SHUTDOWN SYSTEM

The minimum number of functions identified in Table 3.5-4 shall be OPERABLE. With the number of functions less than the minimum required, restore the required function to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within an additional 12 hours.

TABLE 3.5-4
REMOTE SHUTDOWN SYSTEM INSTRUMENTATION AND CONTROLS

Function/Instrument or Control Parameter	Required Number of Functions
MU-V-18	1

Examiner's Note: **Once Pressurizer level is recovering, makeup flow is being controlled, and the Tech Spec call has been declared, Go to Event 5.**

Op Test No.:	1	Scenario #	4	Event #	5	Page	32 of 51
Event Description:	FW-P-1A Trips, Plant Runback with ICS in Manual.						

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the Lead Examiner: Initiate Event 5.		
Indications Available: Main Annunciator Panel alarms M-1-1 and H-1-1 actuate, LO-P-8 starts, FW-P-1A indicate zero RPMs.		
	Crew	Diagnoses FW-P-1A tripped and that a manual runback is required.
		OP-TM-MAP-M0101, FWP 1A Trip
Examiner's Note:		**Crew will be required to run the plant back manually due to ICS being in HAND control. Those steps are listed on the next page.**
	ARO	Step 4.2: Ensure plant runback and determine cause of trip.
	ARO	Step 4.3: Ensure LO-P-8A running by the red running light lit, green light not lit (CL).
	ARO	Step 4.4: Ensure FW-V-1A Closed by the red closed light lit, green open light not lit (CL).
		OP-TM-MAP-H0101, ICS Runback
	URO	Step 4.1: Ensure NI power is reduced to below the limit for the runback condition. If ICS manual control is required, then initiate OP-TM-621-471, ICS Manual Control.

Footnotes: 1 – FW-P-1A: "A" Main Feed Pump
2 – LO-P-8: FW-P-1A Turbine AC Oil Pump.
3 – FW-V-1A: FW-P-1A Discharge Isolation Valve.

Op Test No.:	1	Scenario #	4	Event #	5	Page	33 of 51
Event Description:	FW-P-1A Trips, Plant Runback with ICS in Manual.						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**Crew will run the plant back to 560 MWe (≈ 68% NI power) for a loss of 1 MFP. Actual reactor power may vary due to plant efficiencies.**
	INFO	Step 4.2: INITIATE 1102-4 for power reduction.
		1102-4, Power Operation
	CRS	Step 3.3.2.A.1: Perform Enclosure 2A (for an emergency (forced) power reduction INITIATE Enclosure 2A).
Examiner's Note:		**ULD will go in "Track" mode when the Runback fails to occur and therefore the URO will not be able to control reactivity with the ULD. Control will be taken at the Diamond Panel with Rod Control in Manual for the reactivity manipulation. If the crew elects earlier to place ICS in Hand IAW OP-TM-621-471, the SG/REACTOR DEMAND STATION will be used for the reactivity manipulation.**
	ARO	Step 3.3.2.A.2.a): MAINTAIN Generator Reactive Load IAW OP-TM-301-472.
Examiner's Note:		**Step 3.3.2.A.2.b) is N/A.**
	CRS	Step 3.3.2.A.2.c): If SG/REACTOR DEMAND is in HAND, then REDUCE reactor power IAW OP-TM-621-471 "ICS Manual Operations".
		OP-TM-621-471 "ICS Manual Operations"
	URO	Step 4.1: Ensure ULD in HAND by observing white HAND light lit (CC).
Examiner's Note:		**Steps 4.2.1 through 4.2.3 have already been accomplished in an earlier event.**

Op Test No.:	1	Scenario #	4	Event #	5	Page	34 of 51

Event Description: FW-P-1A Trips, Plant Runback with ICS in Manual.

Time	Position	Applicant's Actions or Behavior
	URO/ARO	Step 4.2.4: If necessary to maintain reactor power or control rods within limits or if a power change is being conducted IAW 1102-4, then ADJUST SG/REACTOR DEMAND as follows: 1. If maintaining stable reactor power or a slow planned power change, then RAISE or LOWER in discrete steps to keep neutron error between +2% and –2%. 2. If rapid power reduction is required, then LOWER as necessary to achieve desired reactor power level and Ensure FW flow controlled within limits by lowering and/or raising on the SG/REACTOR DEMAND toggle switch (CC) as necessary.
Examiner's Note:		**1102-4, Power Operation Step 3.3.2.A.2.d) is N/A.**
		1102-4, Power Operation
	INFO	Step 3.3.2.A.2.e): PERFORM the actions per Enclosure 2B.
		1102-4, Power Operation, Enclosure 2B
	N/A	Prior to FW-U-1A speed < 4000 rpm (between 100%-90% reactor power as a guide): Start LO-P-8A by turning the control switch (CL) clockwise, verifying the red light is lit and the green light is not lit.
Examiner's Note:		**Once Sufficient reactivity manipulation has been observed and Reactor Power < 75%, Go to Event 6.**

Footnotes: 1 – FW-U-1A: "A" Main Feed Pump Turbine.
2 – LO-P-8: FW-P-1A Turbine AC Oil Pump.

Op Test No.: 1	Scenario # 4	Event # 6	Page 35 of 51
Event Description:	RC-P-1B Shaft Shear		

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the Lead Examiner: Initiate Event 6.		
Indications Available: Main Annunciator Panel Alarm F-3-1 in alarm, RC-P-1B amps go to zero.		
	Crew	Diagnoses a sheared shaft on RC-P-1B and will enter OP-TM-MAP-F0301.
Examiner's Note:		**OP-TM-MAP-F0301 Steps 4.1 through 4.3 are N/A.**
		OP-TM-MAP-F0301, RC LOOP FLOW LO
	URO	Step 4.4: Observe the following and determine the faulty RC Pump to be RC-P-1B: - RC-P-1A and RC-P-1B Ammeters (CC) - Bentley-Nevada for elevated vibrations (PLF)
	URO/ARO	Step 4.5.1: If faulty RC Pump is still in operation, then perform the following: - Start at least one RC-P-2 pump by rotating either RC-P-2B-1 or RC-P-2B-2 control switch in the clockwise direction, ensuring that the red light is lit, green light is not lit (CC).

Footnotes: 1 – RC-P-1A: "A" Reactor Coolant Pump.
2 – RC-P-1B: "B" Reactor Coolant Pump.
3 – RC-P-2B-1: RC-P-1B AC Oil Lift Pump.
4 – RC-P-2B-2: RC-P-1B DC Oil Lift Pump.

Op Test No.:	1	Scenario #	4	Event #	6	Page	36 of 51
Event Description:	RC-P-1B Shaft Shear						

Time	Position	Applicant's Actions or Behavior
	URO/ARO	Step 4.5.2: If faulty RC Pump is still in operation, then perform the following: - Start at least one RC-P-3 pump by rotating either RC-P-3B-1 or RC-P-3B-2 control switch in the clockwise direction, ensuring that the red light is lit, green light is not lit (CC).
	CRS	Step 4.5.3: Perform OP-TM-226-150 series procedure to place affected RCP in the Standby mode.
Examiner's Note:		**OP-TM-226-152 Step 4.1 is N/A.**
Procedure Note:		A 2 / 1 RCP combination with OTSG levels > LLLs will require a re-ratio (approximately 30% / 70%) of Feedwater flow to A / B OTSG.
		OP-TM-226-152, SHUTDOWN RC-P-1B
	CRS	Step 4.2: If Reactor power is > 20%, then EVALUATE expected FW Flow requirements for new RCP combination, to minimize effects on Delta Tc.
Examiner's Note:		**OP-TM-226-152 Step 4.3 is not required and step 4.4 has already been accomplished.**
	URO	Step 4.5: Place RC-P-1B in Pull-To-Lock by rotating the Control Switch in the counter-clockwise direction while simultaneously pulling the Control Switch outward to lock it in a PTL position, observing the green light lit, red and amber lights not lit, and a black flag position. (CC).

Footnotes: 1 – RC-P-1B: "B" Reactor Coolant Pump.
2 – RC-P-3B-1: RC-P-1B AC Backstop Oil Pump #1.
3 – RC-P-3B-2: RC-P-1B AC Backstop Oil Pump #2.

Op Test No.:	1	Scenario #	4	Event #	6	Page	37 of 51
Event Description:	RC-P-1B Shaft Shear						

Time	Position	Applicant's Actions or Behavior
	ARO	Re-ratio Main Feedwater by manipulating the toggle switches the for SG "A" FW Demand and SG "B" FW Demand ICS Stations upward or downward, as necessary to achieve feed flows discussed in step 4.2.
Examiner's Note:		**Once Main Feedwater re-ratioing has been observed, Go to Event 7.**

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	38 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the Lead Examiner: Initiate Event 7.		
Indications Available: FW-P-1B RPMs go to zero, Feedwater flow lowers to zero, RCS pressure and temperature rise, OTSG level lowers.		
	Crew	Diagnoses a loss of Feedwater and ATWS.
Examiner's Note:		**The ARO may trip FW-P-1B which will automatically actuate Emergency Feedwater.** **The URO will trip the reactor, as allowed by OS-24:** **4.2 Actions Not Described in Procedures** **A. Licensed operators may take action without procedural guidance, and without taking a variance under the following conditions:** **• Initiating a manual reactor TRIP when a licensed operator believes the reactor is not in a safe condition.** **• Action taken to directly compensate for the failure of an automatic system.** **• Action to manually actuate a safety system when the automatic actuation setpoint is being approached.**
		OP-TM-EOP-001, REACTOR TRIP
CT-24	URO	Step 2.1 (IMA): Presses Both Reactor Trip and DSS pushbuttons (CC).
	URO	Step 2.2 (IMA): Verifies that the reactor is shutdown by <u>one</u> of the following: - Power Range Nuclear Instrumentation indicates less than 5% (CC) - All control rods are inserted (PC) - Source Range count rate is continuously lowering (CC)

Footnote: 1 – FW-P-1B: "B" Main Feed Pump.

Op Test No.: 1	Scenario # 4	Event # 7,8,9	Page 39 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail		

Time	Position	Applicant's Actions or Behavior
	URO	Step 2.3 (IMA): Presses the Turbine Trip pushbutton (CL)
	URO	Step 2.4 (IMA): Verifies the Turbine Stop valves are closed by observing the indication on CL.
	ARO	Performs a Symptom Check, recognizes a Lack of Primary-to-Secondary Heat Transfer based on NO Main Feedwater and NO Emergency Feedwater due to the EF-V-30 valves failing, and informs the CRS.

Examiner's Note:

A Lack of Primary-to Secondary Heat Transfer will be identified based on the following definition found in OS-24:

One of the following sets of conditions :

- **Incore temperatures or THOT rising above 580°F and at least one RC Pump operating.**
- **Incore temperatures rising and NO FEEDWATER available.**
- **Incore temperatures rising and RCS circulation can not be confirmed.**

Following a loss of all RC Pumps, incore temperatures will rise while building natural circulation. Time should be taken to allow for the building of natural circulation.

EF-V-30A and C are failed due to the Instrument Air leak isolation earlier in the scenario. EF-V-30B and 30D will have no flow because EF-V-52B / 52D which are the downstream isolation valves for EF-V-30B / 30D are closed and are required to be opened to allow EFW flow to the OTSGs.

	CRS	Announces entry into OP-TM-EOP-004, LACK OF PRIMARY TO SECONDARY HEAT TRANSFER.

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	40 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-004, LACK OF PRIMARY TO SECONDARY HEAT TRANSFER
	URO	Step 3.1: Ensure no more than one RCP operating per loop by shutting down RC-P-1C or RC-P-1D by rotating the control switch for either pump clockwise, verifying the red light is lit, and the green light is not lit (CC).
Examiner's Note:		**Upon initiating OP-TM-424-901, the ARO will discover and announce that EF-V-30A/B/C/D will not open, and will announce it to the CRS. Any further actions contained in OP-TM-424-901 will be useless.**
	CRS	Step 3.2: Initiate OP-TM-424-901, "Emergency Feedwater".
	ARO	Step 3.3: Announces the reactor trip.
Examiner's Note:		**Steps 3.4-3.7 are N/A.**

Footnotes: 1 – RC-P-1C: "C" Reactor Coolant Pump.
2 – RC-P-1D: "D" Reactor Coolant Pump.
3 – EF-V-30A: EFW Control Valve to "A" OTSG.
4 – EF-V-30B: EFW Control Valve to "B" OTSG.
5 – EF-V-30C: EFW Control Valve to "B" OTSG.
6 – EF-V-30D: EFW Control Valve to "A" OTSG.

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	41 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
Examiner's Note:		**If conditions are met for Step 3.8 the CRS will transition to OP-TM-EOP-009, HPI Cooling. These steps are located on Page 42** **If conditions are met for Step 3.9 the crew will attempt to feed the OTSGs with a Condensate Booster Pump IAW Attachment 1 of OP-TM-EOP-004. The steps of Attachment 1 are located on Page 50**
	ARO	Step 3.8: IAAT RCS pressure approaches 2450 psig (or 527 psig if < 329°F), and feedwater is not available, then GO TO EOP 009 "HPI COOLING".
	CRS	Step 3.9: If all of the following conditions are met: - A Condensate Booster Pump is On - At least one RCP is On - An OTSG is intact; then PERFORM Attachment 1, "OTSG Feed Using a Condensate Booster Pump", to the ARO.

Footnote: 1 – RC-V-2: PORV Isolation Valve.

Op Test No.: 1	Scenario # 4	Event # 7,8,9	Page 42 of 51

Event Description: Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-009, HPI COOLING
	URO	IAAT SCM < 25°F, then perform the following: 1. PERFORM Rule 1 2. CONTINUE with EOP-009
	URO	Step 3.2: Ensure RC-V-2 is OPEN by the red light lit, green light not lit (CC).
	URO	Step 3.3: 4 psig ESAS has been initiated IAW OP-TM-642-902, "4 psig ESAS Actuation".
Booth Note:		**Ensure MU-P-1A and 1C do not start on 4 psig ESAS and that MU-P-1B trips as soon as the ES signal is actuated.**
Examiner's Note:		**Due to no Makeup Pumps operating, the crew will recognize that HPI is not adequate.**
	URO	Step 3.4: Verify Adequate HPI. RNO: Go to Section 4.0.
		OP-TM-EOP-009, Section 4.0: Inadequate HPI
CT-13	URO	Step 4.2.1: IAAT RCS pressure approaches TS 3.1-1 limit or 2450 psig, then perform the following: - ENSURE the PORV block is open by the red light lit, green light not lit (CC).

Footnotes: 1 – RC-RV-2: Pressurizer Pilot Operated Relief Valve.
2 – RC-V-2: PORV Isolation Valve.
3 – MU-P-1A: "A" Makeup (HPI) Pump
4 – MU-P-1B: "B" Makeup (HPI) Pump
5 – MU-P-1C: "C" Makeup (HPI) Pump

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	43 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
CT-13	URO	Step 4.2.2: IAAT RCS pressure approaches TS 3.1-1 limit or 2450 psig, then perform the following: - OPEN the PORV (RC-RV-2) by turning the Control Switch to the open position, verifying MAP alarms G0106 and G0107 are in alarm and flow is indicated on the CC meter.
CT-13	URO	Step 4.2.3: IAAT RCS pressure approaches TS 3.1-1 limit or 2450 psig, then perform the following: - When RCS pressure is reduced to ~1750 psig, or approaches 25 °F SCM, then CLOSE the PORV., verifying MAP alarms G0106 and G0107 are not in alarm and no flow is indicated on the CC meter.
Examiner's Note:		**The URO will perform the above three steps, as necessary, each time the IAAT conditions are met.**
	URO	Step 4.3: Ensure either the PORV or PORV block valve is Closed.
	URO	Step 4.4: Ensure the following RCS Vent Valves are CLOSED by observing the valve positions (PCR): ___ RC-V-28 or RC-V-44 ___ RC-V-40A or RC-V-41A ___ RC-V-40B or RC-V-41B ___ RC-V-42 or RC-V-43

Footnotes: 1 –RC-V-28: Pressurizer Vent to RCDT Isolation Valve.
3 – RC-V-40A: "A" Hot Leg Vent to RCDT and Atmosphere Valve.
4 – RC-V-40B: "B" Hot Leg Vent to RCDT and Atmosphere Valve.
5 – RC-V-41A: "A" Hot Leg Vent to RCDT and Atmosphere Valve.
6 – RC-V-41B: "B" Hot Leg Vent to RCDT and Atmosphere Valve.
7 – RC-V-42: Reactor Vessel Head Vent to RB Atmosphere Valve.
8 – RC-V-43: Reactor Vessel Head Vent to RB Atmosphere Valve.
9 – RC-V-44: Pressurizer Vent Isolation Valve.

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	44 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
Booth Cue:		**Report to the Control Room as Secondary Auxiliary Operator, "I'm down at the EV-F-30 area and EF-V-52B and EF-V-52D are CLOSED. Do you want me to do anything with these valves?"**
Examiner's Note:		**RC-P-1B has already been secured.**
	URO	Step 4.5: If SCM ≥ 25 °F then Shutdown all RC Pumps by rotating the control switch for either pump clockwise, verifying the red light is lit, and the green light is not lit for the remaining two RCP's (RC-P-1A and either RC-P-1C or RC-P-1D) (CC).
Examiner's Note:		**The URO may deenergize the Pressurizer heaters by taking the Control switch for each bank to "OFF".**
	URO	Step 4.6: Ensure all pressurizer heaters are de-energized by observing the Pressurizer heater indicating lights are not lit (CR).
	CRS	Step 4.8: IAAT FEEDWATER is available to at least one OTSG, then GO TO EOP-004
		OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer
Examiner's Note:		**Steps 3.1 to 3.3 were previously performed.**
	CRS	Step 3.4: IAAT primary-to-secondary heat transfer (PSHT) has been established, then GO TO Step 3.19.

Footnotes: 1 – RC-P-1A: "A" Reactor Coolant Pump
2 – RC-P-1B: "B" Reactor Coolant Pump
3 – RC-P-1C: "C" Reactor Coolant Pump

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	45 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
	CRS	Step 3.5: IAAT RCS is approaching 25°F SCM, then GO TO EOP-009.
	URO	Step 3.6: IAAT RCS pressure approaches 2450 psig (or 592 psig if < 313°F) and FEEDWATER is available, then perform the following: 1. ENSURE PORV block (RC-V-2) is Open. 2. OPEN the PORV (RC-RV-2). 3. When RCS pressure approaches 30°F SCM, or 1750 psig, then CLOSE the PORV.
	CRS	Step 3.7: IAAT FEEDWATER is available, then GO TO Step 3.10.
	ARO	Step 3.11: IAAT OTSG pressure < 750 psig, then DEFEAT HSPS Lo-Lo Pressure MFW Isolation.
	URO	Step 3.12: IAAT all RCPs are Off, then INITIATE Guide 7, "RCP Restart".
	ARO	Step 3.13: REDUCE OTSG Pressure so that secondary Tsat is 40 to 60°F lower than incore thermocouple temperature.
Examiner's Note:		**Step 3.14 is N/A**
	ARO	Step 3.15: REDUCE OTSG Pressure so that secondary Tsat is 90 to 100°F lower than incore thermocouple temperature.
CT-26	ARO	Step 3.16: RAISE OTSG level to 75 to 85% Operate Range with EFW.

Footnotes: 1 – RC-V-2: PORV Isolation Valve.
2 – RC-RV-2: Pressurizer Pilot Operated Relief Valve.

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	46	of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail							

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-010, RULE 4, Feedwater Control
	N/A	Step 1: If EFW is actuated, then VERIFY two or more EFW pumps are running. RNO: If only EF-P-2A or EF-P-2B are operating, then MAINTAIN flow to OTSGs < 515 gpm.
Examiner's Note:		**SCM can only be determined by the PPC when the RCP's are secured and Natural Circulation has not been verified per OS-24, Conduct of Operations During Abnormal and Emergency Events:** **If any of the following conditions exist:** **o All RCPs are shutdown and natural circulation has not been verified in both loops** **o TI-977 and TI-978 are not valid** **o TI-977 or TI-978 (SCM indication) is less than 25F and hot leg temperature is changing rapidly (i.e. immediately after a reactor trip or temperature lowering at greater than 900 F/HR),** **then USE incore subcooling margin C4008 (or C4132). Otherwise, USE the most conservative subcooling margin indicator on PCL (TI-977 or TI-978).**
	ARO	Step 2: Verify SCM > 25°F or OTSG level between 75 to 85% Operating Range Level by observing that SCM is greater than 25°F on the PPC.
CT-26	ARO	Step 3: Verify the OTSG is not dry. RNO: If Primary to Secondary Heat Transfer is not available to either OTSG, then initiate FW as follows: - If EFW is not available, then MAINTAIN MFW flow < 0.2 Mlb/HR / OTSG. END

Footnotes: 1 – EF-P-2A: "A" Motor Driven Emergency Feedwater Pump
2 – EF-P-2B: "B" Motor Driven Emergency Feedwater Pump

Op Test No.: 1	Scenario # 4	Event # 7,8,9	Page 47 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail		

Time	Position	Applicant's Actions or Behavior

Examiner's Note: **The ARO should report to the CRS the status of Feedwater and direct the Auxiliary Operator to open one or both EF-V-52 valves and restore feedwater to at least one dry OTSG. The crew will continue in OP-TM-EOP-009 until they reach Step 4.8 at which time they verify feedwater is available and re-enter OP-TM-EOP-004.**

With feedwater restored to an OTSG there is a possibility of losing Sub Cooling Margin. If this occurs the crew will take one of the following three paths based on procedural guidance:

- **If the crew is in OP-TM-EOP-004 when approaching loss of SCM, the procedure directs them to OP-TM-EOP-009.**
- **If the crew is in OP-TM-EOP-009 at the time SCM is lost, the procedure directs them to perform OP-TM-EOP-010 Rule 1 and then remain in EOP-009.**
- **If SCM is lost when the crew is in any other procedure or plant condition, they will enter OP-TM-EOP-002.**

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-002, Loss of 25°F Subcooling Margin
	ARO	Step 2.1: Perform Rule 1, LSCM
		OP-TM-EOP-010, Rule 1, LSCM
	ARO	Step 1: VERIFY it has been more than two minutes since RCP start.
	URO	Step 2: ENSURE all RCPs are shutdown within one minute by performing the following: • IAAT a RCP cannot be secured from the Console, then de-energize 1A 6900v and 1B 6900v busses. • ENSURE RC-P-1A is OFF. • ENSURE RC-P-1B is OFF. • ENSURE RC-P-1C is OFF. • ENSURE RC-P-1D is OFF.

Footnotes: 1 – RC-P-1A: "A" Reactor Coolant Pump
2 – RC-P-1B: "B" Reactor Coolant Pump
3 – RC-P-1C: "C" Reactor Coolant Pump
4 – RC-P-1D: "D" Reactor Coolant Pump

Op Test No.: 1	Scenario # 4	Event # 7,8,9	Page 48 of 51				

Event Description: Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail

Time	Position	Applicant's Actions or Behavior
	URO	Step 3: INITIATE 4 # ESAS Actuation IAW OP-TM-642-902 4# ESAS Actuation.
	URO	Step 4: INITIATE OP-TM-424-901, "Emergency Feedwater" and FEED IAW Rule 4.
Examiner's Note:		**OP-TM-EOP-002Steps 3.1 through 3.5 will be N/A**
		OP-TM-EOP-002, Loss of 25°F Subcooling Margin
	CRS	Step 3.6: REQUEST SM evaluate Emergency Action Levels (EALs).
	ARO	Step 3.7: ENSURE performance of an alarm review.
	URO	Step 3.8: Verify all Reactor Coolant Pumps are shutdown.
	CRS	Step 3.9: VERIFY one of the following exists: • SCM > 25 °F, • ADEQUATE HPI. **RNO: GO TO Section 4.0, Rapid RCS Cooldown**
Examiner's Note:		**Steps 4.1 and 4.2 will not be performed during this scenario.**
	ARO	Step 4.3: IAAT OTSG pressure < 750 psig, then DEFEAT HSPS Lo Lo Pressure MFW Isolation.
	ARO	Step 4.4: RAISE OTSG Operate Range level to 75 to 85% using EFW.
Examiner's Note:		**The scenario can be terminated when an OTSG is being fed by feedwater to > 6" on Startup Range instruments.**

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	49 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior

Follow-up question: What was the highest event entered during scenario?

Answer:

MA2 due to:

1. **Automatic Reactor Trip was unsuccessful and Manual Reactor Trip was successful.**

OR

FA1 due to:

1. **Loss of SCM or HPI / PORV Cooling Used.**

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	50 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-004, ATTACHMENT 1, OTSG feed using a Condensate Booster Pump
	N/A	Step 1: IAAT EFW is recovered, then perform: N/A
	ARO	Step 2: Ensures CLOSED the following: - FW-V-16A by observing the FW-V-16A Bailey Station indicator at zero (CC). - FW-V-16B by observing the FW-V-16B Bailey Station indicator at zero (CC).
	ARO	Step 3: Maintains TSDT IAW Guide 14
CT-26	ARO	Step 4: Opens FW-V-6 by pressing the red open pushbutton and observing the red open pushbutton lit, green closed pushbutton closed (CL).
CT-26	ARO	Step 5: When OTSG Pressure < 750 psig, then defeats OTSG Lo-Lo Pressure MFW Isolation by pressing the Lo-Lo Pressure MFW Isolation bypass pushbuttons and observing the amber lights for each are lit (CC and CL).
CT-26	ARO	Step 6: When OTSG Press <600 psig, then Feeds IAW Rule 4.
	ARO	Step 7: Throttle MS-V-3's to maintain OTSG Press 500-600 psig by adjusting the toggle switch on each Turbine Bypass Valve Bailey Station in either the upward or downward direction, as necessary, to maintain proper OTSG pressure.
	N/A	Step 8: IAAT FEEDWATER is not available, then perform the following: A. ENSURE CLOSED MS-V-3's. B. ENSURE CLOSED MS-V-4's. C. GO TO Step 3.5.

Footnotes: 1 – FW-V-16A: "A" Feedwater Startup Control Valve
2 – FW-V-16B: "B" Feedwater Startup Control Valve
3 – FW-V-6: Main Feedwater Pump Bypass
4 – MS-V-3's: Turbine Bypass Valves
5 – MS-V-4's: Atmospheric Dump Valves

Op Test No.:	1	Scenario #	4	Event #	7,8,9	Page	51 of 51
Event Description:	Loss of Feedwater, ATWS, EFW Control Valves Fail, LOHT, HPI Pumps Fail						

Time	Position	Applicant's Actions or Behavior