Facility:	Sequoyah	Scenario No.:	1	Op Test No.:	NRC
Examiners:		Operators:			

Initial Conditions: ~24% power equilibrium. 1A-A RHR Pump Out of Service.

Turnover: Plant startup was held at ~24% for approximately 70 hours for MFW Regulating valve repair. Repairs are complete continue Power increase to 100%.

Target CTs: Insert Negative Reactivity using rods or boration prior to completion of FR-S.1 Step 4.

Isolate Faulted S/G #3 prior to transition out of E-2 by closing the faulted S/G MSIV or MSIVs for all non-faulted S/Gs and isolating all feedwater flow, including AFW flow, to the faulted S/G.

Event #	Malf. No.	Event Type*	Event Description
1	N/A	R-ATC N-SRO/BOP	Increase power from ~24%.
2	RX06B	TS-SRO I-SRO/ATC N-ATC	Pressurizer level Channel failure (LT-68-335). Requires AOP-I.04 performance including selection of operable channel and restoration of letdown (N-ATC). SRO Tech Spec Evaluation. N - L/D Restoration
3	RD07D4	TS-SRO C-SRO/ATC	Dropped Rod (D-4) with reactor trip not required results in Auto rod withdrawal and Immediate action to place rods in manual. AOP-C.01 is performed. SRO Tech Spec Evaluation.
4	TCR02	N/A	Inadvertent Turbine Trip does not result in or require reactor trip since power is less than 50%. Crew will stabilize plant and perform AOP-S.06.
5	EG07	C-SRO/BOP	Main generator fails to trip when main turbine trips requiring main generator PCBs to be manually opened.
6	RD07M4 RD07M12 RD07D12	M-All	Remaining rods in same group with rod D-4 are dropped resulting in reactor trip signal however, reactor trip does not occur due to ATWS.
7	RP01C	C-All	ATWS – Both RTBs fail to open. Rods are manually inserted and Emergency Boration is initiated.
8	FW23C	C-SRO/BOP	Loop 3 Feedwater Line break inside containment.
9	RP07	C-SRO/ATC	Failure of Hi-Hi containment pressure logic to initiate Phase B containment isolation.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 1 Summary

Crew will assume shift at ~24% power with 1A-A RHR pump out of service. Crew directions will be to increase power to 100%.

When adequate power change has been completed, Pressurizer level Channel LT 68-335 fails low resulting in letdown isolation. SRO will direct performance of AOP-I.04 to select operable channel and restore letdown. SRO will also evaluate Tech Specs.

When AOP-I.04 is complete and letdown has been restored, Control rod D-4 drops into the core. Due to power level and core location, an automatic reactor trip signal is not generated and manual reactor trip is not required for a single dropped rod. However, automatic rod withdrawal results requiring ATC to take immediate action to place rods in manual. SRO will direct performance of AOP-C.01 and evaluate Tech Specs.

When applicable actions of AOP-C.01 are complete, an inadvertent Main Turbine trip will occur. An automatic Reactor trip signal is not generated with power level less than 50%. Crew should be able to stabilize plant and implement AOP-S-06 including power reduction to 20%. Rods should still be in manual. Normally 30 seconds after a turbine trip, the Generator trips and the PCBs open, however, in this scenario the generator trip fails to occur which requires manually opening the Main Generator PCBs. It is possible that if power level has been increased substantially above the initial 24% level, a heater string isolation could occur requiring manual Reactor Trip while performing AOP-S.06.

Assuming heater string isolation does not occur, the remaining 3 rods in the group with rod D-4 drop into the core producing an automatic negative rate reactor trip signal. The reactor does not trip due to an ATWS condition and the crew will enter FR-S.1. ATC will manually insert control rods and most likely BOP will initiate emergency boration to complete the first critical task. One of the ROs will dispatch operators to trip the reactor locally.

When the crew has completed FR-S.1, a feedwater line break occurs on loop #3 inside containment which will require a safety injection. When containment pressure reaches the Hi-Hi pressure setpoint of 2.81 psi, automatic Phase B containment isolation does not occur requiring manual actuation. Crew will continue in E-0 and transition to E-2 to isolate or verify isolated the faulted S/G to complete the second critical task. Upon completion of E-2, crew should transition to SI Termination procedure ES-1.1. FR-Z.1 may require brief entry for high containment pressure but is exited at step 4 for faulted S/G entry.

The scenario may be terminated when crew transitions to SI Termination procedure ES-1.1.

Op Test No.: NRC	Scenario # 1	Event # 1	Page 1 of 43
Event Description: Raise Power			

Time	Position	Applicant's Actions or Behavior

Console Operator:

No action required for Event 1

Indications available:

None: Crew will continue power increase from 24% IAW 0-GO-4, Section 5.5 at Step [21]

	CREW	**INITIATE** load increase in accordance **TI-40** to less than or equal to 30% reactor power WHILE continuing this instruction **AND** **ADJUST** turbine load as needed while maintaining valve position limit approximately 10% above governor control indication.
	BOP	Increase Turbine Load as directed
	RO	Withdraw Control Rods as directed
	RO	Perform dilutions as directed

Evaluator Note: The following Steps are from 0-SO-62-7 *Boron Concentration Control*, Section 6.2, *Dilute*

CAUTION 1: When making an RCS dilution of $\geq$3000 gallons, it should be done in batches with an RCS boron concentration verification at the halfway point (e.g., 1500 gallons). Allow at least 15 minutes between batches.

CAUTION 2; Returning the Boric Acid Blender to service after unplugging, cleaning, or maintenance on the Boric Acid System could introduce debris, sludge, air or chunks of solidified boron into the CCP suction resulting in pump damage. Extreme care must be exercised to properly flush the Boric Acid Blender system following an outage.

NOTE 1: If an excessive amount of dilution is required (plant startup), the pressurizer heaters should be energized to cause pressurizer spray operation for equalizing boron concentration in RCS and pressurizer.

NOTE 2: Dilute mode will be used anytime a long-term positive reactivity addition is desired. The operator should use the normal dilute mode whenever conditions permit.

Op Test No.: NRC Scenario # 1 Event # 1 Page 2 of 43

Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
	RO	**ENSURE** unit is NOT in a Tech Spec or TRM action that prohibits positive reactivity additions.
NOTE: HUT level increase of 1% is equal to 1380 gallons (TI-28 fig. C.21)		
	RO	**ENSURE** sufficient capacity available in the HUT selected to receive expected amounts of CVCS letdown: (**N/A** if not used)

HUT	LEVEL	INITIALS
A	_____ %	_____
B	_____ %	_____

	RO	**ENSURE** makeup system is aligned for **AUTO** operation in accordance with Section 5.1.
	RO	**RECORD** the quantity of dilution water required to achieve desired boron concentration using Appendix D. (**N/A** for minor power changes)
NOTE Due to eyeball interpolation the verified calculation may slightly differ from the initial calculation. The following signoff indicates that any differences in the two results have been discussed and are close enough to be considered validated.		
	SRO	**PERFORM** Appendix I Independent Verification of Calculation for Amount of Boric Acid or Primary Water. (N/A if App. D was performed by SRO to verify data from Rx Engineering) ***(Step not required provided in shift turnover package)***
	RO	**PLACE [HS-62-140A]**, Boric Acid Supply to Blender Flow Control Switch to the **STOP** position.
	RO	**PLACE [HS-62-140B]**, CVCS Makeup Selector Switch to the **DILUTE** position.
	RO	**ENSURE [HS-62-140D]**, Boric Acid Valve to the Blender is **CLOSED** (Green light is **LIT**).
	RO	**SET [FQ-62-142]**, Batch Integrator for the desired quantity.

Op Test No.: NRC Scenario # 1 Event # 1 Page 3 of 43

Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
NOTE: Primary Water Flow Controller **[FC-62-142]** receives its reference signal (70 gpm) from setpoint potentiometer (dial indicator) located on panel M-6. A setpoint of 35% corresponds to a 70 gpm primary water flow rate.		
	RO	**ADJUST [FC-62-142]**, Primary Makeup Water Flow Controller for the desired flow rate.
	RO	**PLACE [HS-62-140A]**, Boric Acid Supply to Blender Flow Control Switch to the **START** position.
NOTE: Flow oscillations and/or erratic controller response may require manual operation of Primary Water Flow Controller **[FC-62-142]** until stable conditions exist.		
	RO	**VERIFY** the following; **[a]** Inlet to top of VCT [FCV-62-128] is **OPEN**. **[b]** Primary Water flow by [FI-62-142A] **OR** [FQ-62-142].
NOTE: Alternate dilution in small amounts is acceptable on a regular basis, provided no significant changes in seal water temperature or seal leakoff are indicated. Batches of 5 to 10 gallons may be added through FCV-62-144 on a frequency not to exceed once per 30 minutes. ICS points for No. 1 seal leakoffs and seal water temperatures on the RCPs should be monitored during and after dilution.		
	RO	**IF** primary water addition to the bottom of the VCT [FCV-62-144] is desired, **THEN** **[a]** **CLOSE** [FCV-62-128] with [HS-62-128]. **[b]** **OPEN** [FCV-62-144] with [HS-62-144]. **[c]** **VERIFY** Primary Water flow by [FI-62-142A] **OR** [FQ-62-142]. *(Step should be marked N/A)*
NOTE: It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.		
	RO	**MONITOR** nuclear instrumentation and reactor coolant temperature to ensure the proper response from dilution.
	RO	**IF [LI-62-129]**, Volume Control Tank Level, increases to 63 percent, **THEN ENSURE [LCV-62-118]**, Volume Control Tank Divert Valve **OPENS** to divert excess water to the Holdup Tanks.

Op Test No.: NRC	Scenario # 1	Event # 1	Page 4 of 43
Event Description: Raise Power			

Time	Position	Applicant's Actions or Behavior
	RO	**WHEN** dilution is complete, **THEN** **[a] PLACE** [HS-62-140A], Boric Acid to Blender Flow Control Switch to the **STOP** position. **[b] IF** [FCV-62-144] was previously **OPENED, THEN** **CLOSE** [FCV-62-144] with [HS-62-144]. (*Step should be marked N/A*) **[c] VERIFY** no primary water flow on either [FI-62-142A] **OR** [FQ-62-142]. **[d] ENSURE** [FCV-62-128] is **CLOSED**.
Lead Examiner may direct initiation of the next event at his discretion. Steps on the next two pages are associated with performance of repetitive dilutions or may not be performed until all dilutions are complete.		

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Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
	RO	**[17] IF** power increase in progress and additional dilutions will be required, **THEN** use this table to re-perform steps **[4]** through **[18]**.

STEP	1st	2nd	3rd
[4] RECORD the quantity of dilution water required to achieve desired boron concentration using Appendix D.	Quantity	Quantity	Quantity
[5] PERFORM Appendix I, IV of Calculation for amount of BA or PW.	SRO	SRO	SRO
[6] PLACE [HS-62-140A], Boric Acid Supply to Blender Flow Control Switch to the **STOP** position.	1st CV	1st CV	1st CV
[7] PLACE [HS-62-140B], CVCS Makeup Selector Switch to the **DILUTE** position.	☐	☐	☐
[8] ENSURE [HS-62-140D] Boric Acid Valve to Blender is **CLOSED** (Green light LIT).	☐	☐	☐
[9] SET [FQ-62-142], Batch Integrator for the desired quantity.	1st CV	1st CV	1st CV
[10] ADJUST [FC-62-142], Primary Makeup Water Flow Controller for the desired flow rate.	1st CV	1st CV	1st CV
[11] PLACE [HS-62-140A], BA Supply to Blender Flow Control Switch to **START**.	1st CV	1st CV	1st CV
[12] VERIFY the following:			
[a] Inlet to top of VCT [FCV-62-128] is OPEN.	☐	☐	☐
[b] Primary Water flow by [FI-62-142A] or [FQ-62-142].	☐	☐	☐
[13] IF PW addition to top of VCT [FCV-62-128] is not warranted, but PW addition to the bottom of the VCT [FCV-62-144] is desired, THEN			
[a] CLOSE [FCV-62-128]with [HS-62-128]	☐	☐	☐
[b] OPEN [FCV-62-144] with [HS-62-144].	☐	☐	☐
[c] VERIFY Primary Water flow by [FI-62-142A] or [FQ-62-142].	☐	☐	☐
[14] MONITOR nuclear instrumentation and reactor coolant temperature to ensure the proper response from dilution.	☐	☐	☐
[15] IF [LI-62-129], VCT level, increases to 63 percent, THEN ENSURE [LCV-62-118], VCT Divert Valve, OPENS to divert excess water to the HUTs.	☐	☐	☐
[16] WHEN dilution is complete, THEN			
[a] PLACE [HS-62-140A], Boric Acid to Blender Flow Control Switch to **STOP**	1st CV	1st CV	1st CV
[b] IF [FCV-62-144] was previously OPENED, THEN CLOSE [FCV-62-144] with [HS-62-144].	☐	☐	☐
[c] VERIFY no primary water flow on either [FI-62-142A] or [FQ-62-142].	☐	☐	☐
[d] ENSURE [FCV-62-128] is CLOSED.	☐	☐	☐

[18] IF Step **[17]** will be repeated, **THEN**
PERFORM the following:
[a] PLACE [HS-62-140B], CVCS Makeup Selector Switch to the **AUTO** position.

[b] PLACE [HS-62-140A], BA to Blender Flow Control Switch to **START** position.
[c] ENSURE dilution is logged in Unit Narrative Log.

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Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
	RO	**REALIGN** the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1.
	RO	**ENSURE** dilution(s) is logged in Unit Narrative Log.
NOTE Sample may be obtained at normal RCS sample intervals provided the unit is at power and the unit response following the dilution is as expected.		
		IF RCS boron sample is required, **THEN NOTIFY** Chem Lab to obtain RCS boron sample.
Evaluator Note: The following Steps continue the 0-GO-4 Section 5.5 power increase at step [22].		
NOTE HS-5-94 located in turbine building el 706, Col. T3G (Unit 1), Col. T14G (Unit 2).		
	BOP	PLACE [HS-5-94] Low Point Drains in the CLOSED position.
	RO	**VERIFY** intermediate range trip bistables: XX-55-5 trip status panel window 2 **LIT**. XX-55-5 trip status panel window 22 **LIT**.
	RO	**VERIFY** power range trip bistables status as follows: XX-55-5 trip status panel window 6 **LIT**. XX-55-5 trip status panel window 26 **LIT**. XX-55-5 trip status panel window 46 **LIT**. XX-55-5 trip status panel window 66 **LIT**.
CAUTION **After refueling operations, the NIS indications may be inaccurate until calibration at higher power levels has been performed.**		
	SRO	IF startup is initial startup after a refueling, THEN **VERIFY** the following steps have been completed at approximately 30% Rx power: [C.2] *(Step is N/A based on turnover information)*

Op Test No.: NRC Scenario # 1 Event # 1 Page 7 of 43

Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
		NOTE Unit 1 Secondary Boric Acid Injection is not required following S/G replacement.
	CREW	IF Secondary System Boric Acid Injection is in service, **THEN** **ENSURE** boric acid concentration is within acceptable range prior to placing MSR second stage reheat in service. *(Concentration will be within acceptable range)*
		NOTE 0-PI-OPS-047-760.1 Section 6.1 (Actual Overspeed Test) should be performed at least once every 12 months, but NOT to exceed 18 months. Section 6.1 may be performed prior to loading the turbine or after a soak period with the turbine loaded.
	SRO	IF 0-PI-OPS-047-760.1 Section 6.1 is to be performed following a soak period with the turbine loaded, **THEN** **PERFORM** the following: *(Step will be N/A)*
	BOP	**ENSURE** 1,2-LCV-6-105A and B are maintaining #3 heater drain tank level with in its normal operating range.
	BOP	IF #7 heater drain tank (HDT) pressure is indicating an overpressurization condition, **THEN** GO TO 1,2-SO-5-3, Section 8.0, Infrequent Operation to prevent #7 HDT overpressurization.
	SRO	IF desired to place #3 and #7 heater drain tanks on recirc, **THEN** **PERFORM** applicable sections of 1,2-SO-5-2 and 1,2-SO-5-3. *(Step will be previously completed)*
		ENSURE the remaining available pumps are aligned and ready for service in accordance with 1,2-SO-2/3-1: Condensate booster pumps. Hotwell pump. *(Pumps will be aligned and ready for service)*

Op Test No.: NRC Scenario # 1 Event # 1 Page 8 of 43

Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
	BOP	**IF** running condensate booster pump reaches approximately 140 amps, **THEN** **START** the following pumps in accordance with 1,2-SO-2/3-1: Third HW pump (if available). Second CBP.
		NOTE 0-SI-OPS-092-078.0 may be performed at the discretion of the Operator if one or more PRMs is indicating close to the ± 2% tolerance.

	CREW	**PERFORM** the following PRIOR TO exceeding 30% reactor power:
		IF LEFM indication is available, **THEN**
		CALCULATE Calorimetric power:
		Calorimetric power= U2118 _____ / 34.55 = _____%
		IF LEFM indication is NOT available, **THEN**
		CALCULATE reactor power:
		Average value of RCS ΔT (UO485)=_____%

	BOP	**VERIFY** all NIS Power Range channel drawers are within ± 2% of the calculated reactor power: N-41 (X1-92-5005B) YES ☐ NO ☐ N-42 (XI-92-5006B) YES ☐ NO ☐ N-43 (XI-92-5007B) YES ☐ NO ☐ N-44 (XI-92-5008B) YES ☐ NO ☐
	SRO	**IF** any of the above steps are checked NO, **THEN** **PERFORM** 0-SI-OPS-092-078.0. *(Step should be N/A)*

Op Test No.: NRC Scenario # 1 Event # 1 Page 9 of 43

Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
	SRO	**MAINTAIN** reactor power at less than or equal to 30% **UNTIL** SG, condensate, and feedwater chemistry is within limits for power ascension. *(Chemistry will be within limits per turnover information)*
		CAUTION **Rolling the second MFP at this low power level with the #7 HDT pumps NOT pumping forward or bypassing to condenser may cause condensate perturbations and/or low pressure heater string isolations.**
	SRO	IF desired to roll second MFPT for maintenance, testing, etc., **THEN** *(Step will be N/A)*
	SRO	IF 0-SI-OPS-092-078.0 has **NOT** been completed, **THEN** **ENSURE** 0-SI-OPS-092-078.0 is completed. *(SI has been completed)*
	SRO	**ENSURE** steps 5.5[1] through 5.5[36] of this section complete. (applicable steps)
	CREW	**REVIEW** plant parameters and indications, **AND** **VERIFY** stability prior to power ascension.
	SRO	IF desired to continue power ascension, **THEN** **GO TO** 0-GO-5, *Normal Power Operation.*

When power has been raised sufficiently lead examiner may cue the next event.

Op Test No.: NRC Scenario # 1 Event # 2 Page 10 of 43

Event Description: Pressurizer Level Channel Fails Low - LT-68-335

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 2		
Indications available: • **Annunciator XA-55-5A Window E-3 "LS-68-335E/D PRZR LVL LOW HEATER OFF & LETDOWN SECURED"** • **Indicator LT-68-335 indicates Zero** • **Letdown is Isolated** • **Pressurizer Heaters turn off** • **Annunciator XA-55-27B-B Window A-5 "LETDOWN HX OUTLET FLOW/TEMP ABNORMAL"**		
	RO	Diagnose and announce failure.
	SRO	Enter and direct actions of AOP-I.04 Section 2.4
NOTE:		Appendix M shows layout of PZR level control for operator reference.
	RO	**CHECK** LI-68-339 NORMAL.
	RO	**CHECK** LI-68-335 NORMAL. *(RNO Required)* **PERFORM** the following: a. **ENSURE** LEVEL CONTROL CHANNEL SELECTOR switch XS-68-339E in LT-68-339 & 320. b. **ENSURE** LEVEL REC CHANNEL SELECTOR switch XS-68-339B in LT-68-320 or LT-68-339. c. **GO TO** Step 4.
	RO	**CHECK** letdown IN SERVICE. *(RNO Required)* **RESTORE** letdown **USING** EA-62-5, Establishing Normal Charging and Letdown.
Evaluator Note: Steps from EA-62-5 are on pages 13 – 15.		

Op Test No.: NRC Scenario # 1 Event # 2 Page 11 of 43

Event Description: Pressurizer Level Channel Fails Low - LT-68-335

Time	Position	Applicant's Actions or Behavior
	SRO	**EVALUATE** the following Tech Specs for applicability: • 3.3.1.1 (3.3.1), Reactor Trip System Instrumentation **Action 6a (From Table 3.3-1 Item 11) Applies – Trip inop Bistables W/I 6 Hrs** • 3.3.3.5 Remote Shutdown Instrumentation **N/A** • 3.3.3.7 Accident Monitoring Instrumentation **Action 2a (From Table 3.3-10 Item 7) Applies – Return to Operable W/I 30 days.** • 3.4.4 Pressurizer Heaters (may be applicable while heaters are unavailable due to instrument failure) **3.4.4 Action b applies until selector switch is used to remove the failed channel from heater control.**
	RO	**ENSURE** pressurizer heaters restored to service.
CAUTION	**RCS pressure changes and changes in RCS boron concentration (due to differences between pzr and RCS boron) may impact core reactivity.**	
	RO	**MONITOR** reactor power: a. **CHECK** reactor in Mode 1 or 2. b. **MONITOR** core thermal power for unexpected changes.

Op Test No.: NRC Scenario # 1 Event # 2 Page 12 of 43

Event Description: Pressurizer Level Channel Fails Low - LT-68-335

Time	Position	Applicant's Actions or Behavior
NOTE:		If performing AOP in conjunction with AOP-I.11 for an Eagle LCP failure, then actions to hard trip bistables should be delayed until Eagle system reset is attempted. Actions to hard trip bistables must be completed within 6 hours UNLESS affected loop is restored to operable status by resetting Eagle rack.
	CREW	**NOTIFY** MIG to remove failed pressurizer level channel from service **USING** appropriate Appendix:

PZR LEVEL INSTRUMENT	CHANNEL	APPENDIX
L-68-339 (L-459)	I	I
L-68-335 (L-460)	II	J
L-68-320 (L-461)	III	K

(Appendix J will apply)

	SRO	**GO TO** appropriate plant procedure.
Evaluator Note:		The following Crew Brief and Notification actions are not contained in the procedure.
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Lead Examiner may cue next event when AOP I.04 and Tech Spec Evaluation are complete.

Op Test No.: NRC Scenario # 1 Event # 2 Page 13 of 43

Event Description: Pressurizer Level Channel Fails Low - LT-68-335

Time	Position	Applicant's Actions or Behavior

The following steps are from EA-62-5 Section 4.3
"Establishing Normal Letdown Flow"

NOTE: EA-62-3, Establishing Excess Letdown, may be utilized if Normal Letdown cannot be established.

	RO	1. **IF** charging flow **NOT** established, **THEN** **PERFORM** Section 4.2. *(Step should be N/A)*
	RO	2. **VERIFY** pressurizer level greater than 17%.
	RO	3. **ENSURE** letdown orifice isolation valves CLOSED:

LETDOWN ORIFICE ISOLATION VALVES	CLOSED √
FCV-62-72	☐
FCV-62-73	☐
FCV-62-74	☐

	RO	4. **OPEN** letdown isolation valves:

LETDOWN ISOLATION VALVES	OPEN √
FCV-62-69	☐
FCV-62-70	☐
FCV-62-77	☐

NOTE: Placing cooling water on the Letdown Heat Exchanger prior to restoring letdown flow should prevent TIS-62-79B/A from actuating and fully opening TCV-70-192.

	RO	5. **PLACE** [HIC-62-78] in **MANUAL, AND** **OPEN** [TCV-70-192] to ~ 50%.
	RO	6. **PLACE** letdown pressure controller [PCV-62-81] in MANUAL and **ADJUST** output between 40% and 50%, (50%-60% open).
	RO	7. **ADJUST** charging flow as necessary to prevent flashing in the letdown line.

Op Test No.: NRC Scenario # 1 Event # 2 Page 14 of 43

Event Description: Pressurizer Level Channel Fails Low - LT-68-335

Time	Position	Applicant's Actions or Behavior
	RO	8. **OPEN** letdown orifice isolation valves as needed:

LETDOWN ORIFICE ISOLATION VALVES	OPEN √
FCV-62-72	☐
FCV-62-73	☐
FCV-62-74	☐

NOTE	Normal letdown pressure is 325 psig at normal operating temperature.	
	RO	9. **ADJUST** letdown pressure controller [PCV-62-81] output to obtain desired pressure.
	RO	10. **ADJUST** letdown pressure controller [PCV-62-81] setpoint to match existing pressure.
	RO	11. **PLACE** letdown pressure controller [PCV-62-81] in AUTO.
NOTE	Normal letdown temperature is ~100°F.	
	RO	12. **ADJUST** [HIC-62-78A] to obtain desired letdown temperature, as indicated on [TI-62-78].
	RO	13. **PLACE** [HIC-62-78A] in **AUTO**.
NOTE	Letdown temperature may swing due to repeated actuation of TIS-62-79B/A, which causes letdown temperature control valve TCV-70-192 to fully open.	
	RO	14. **IF** necessary to stabilize letdown temperature, **THEN** **PERFORM** the following: a. **PLACE** [HIC-62-78A] in MANUAL and **ADJUST** controller output in OPEN direction. b. **WHEN** letdown heat exchanger outlet temperature is stabilized at approximately 100°F, **THEN** **PLACE** [HIC-62-78A] in AUTO. *(Typically not required)*

Op Test No.: NRC Scenario # 1 Event # 2 Page 15 of 43

Event Description: Pressurizer Level Channel Fails Low - LT-68-335

Time	Position	Applicant's Actions or Behavior
	RO	15. **ENSURE** high temperature divert valve **[HS-62-79A]** in DEMIN position.
	RO	16. **ADJUST** charging and letdown as necessary to maintain RCP seal injection flow and pressurizer level.
	RO	17. **IF** CCP suction is aligned to the RWST and realigning CCP suction to VCT is desired, **THEN** ..... *(Step should be N/A)*
		18. **GO TO** Section 4.1, step in effect. *(No additional actions section 4.1 should be required)*
		END OF TEXT

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	16	of 43
Event Description:	Control Bank D Group 1 Dropped Rod (D-4)							

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 3		
Indications available: • **Control Bank D Rod D-4 Rod Bottom Light Lit and RPI indicates Zero.** • **Annunciator XA-55-4B Window D-7 "FULL LENGTH RODS RODS AT BOTTOM** • **Annunciator XA-55-6A Window B-1 "NC-41U/NC-41K NIS POWER RANGE HIGH NEUTRON FLUX RATE"** • **Annunciator XA-55-4B Window D-4 "COMPUTER ALARM ROD DEV & SEQ NIS PWR RANGE TILTS"** • **Automatic Rod Withdrawal**		
	RO	Diagnose failure and place rods in manual to stop withdrawal Refer to Annunciator Response Procedure
	SRO	Enter and direct action of AOP-C.01 Section 2.2
NOTE:	Steps 1 and 2 are immediate action steps.	
	RO	**PLACE** rod control in MAN.
	RO	**VERIFY** ONLY ONE rod dropped.
NOTE:	If a dropped rod occurs at low power level, retrieval of the dropped rod is NOT the conservative action to take and could violate Tech Specs (if Mode 2 has been entered). **[C.2]**	
	RO	**MONITOR** reactor power greater than 5%.
	BOP/RO	**REDUCE** load to control T_{avg}: a. **MONITOR** T-avg greater than 541°F. (LCO 3.1.1.4) b. **CHECK** main turbine loaded. c. **REDUCE** turbine load to establish T_{avg} within 3°F of T_{ref}.

Op Test No.: NRC	Scenario # 1	Event # 3	Page 17 of 43
Event Description:	Control Bank D Group 1 Dropped Rod (D-4)		

Time	Position	Applicant's Actions or Behavior
	CREW	**MONITOR** Quadrant Power Tilt Ratio (QPTR) less than 1.09 **USING** one of the following: • ICS OR • 0-SI-NUC-000-133.0, Quadrant Power Tilt Ratio. *(If applicable RNO action N/A <50% power)*
	SRO	**EVALUATE** the following Tech Specs/TRM for applicability: • 3.1.1.4, Minimum Temperature for Criticality **N/A** • 3.1.3.1, Movable Control Assemblies, Group Height **Action c Applies** • 3.1.3.2, Position Indication Systems - Operating **N/A** • 3.1.3.5, Shutdown Rod Insertion Limit **N/A** • 3.1.3.6, Control Rod Insertion Limits N/A • 3.2, Power Distribution Limits (entire section) **DNB Parameters LCO 3.2.5 Action may apply momentarily while RCS pressure is <2220 psia (2205 psig)**
NOTE	Core thermal power must be reduced to less than 75% <u>within one hour</u> and shutdown margin must be verified <u>within one hour</u> UNLESS dropped rod can be restored in one hour. (LCO 3.1.3.1 action c)	

Op Test No.: NRC Scenario # 1 Event # 3 Page 18 of 43

Event Description: Control Bank D Group 1 Dropped Rod (D-4)

Time	Position	Applicant's Actions or Behavior
	SRO	**PERFORM** the following to comply with LCO 3.1.3.1: **INITIATE** power reduction to less than 75% **USING** one of following: • AOP-C.03, Rapid Shutdown or Load Reduction OR • 0-GO-5, Normal Power Operation. *(N/A Power already less than 75%)* b. **VERIFY** adequate Shutdown Margin within 1 hour and once every 12 hours **USING** SI-NUC-000-038.0. *(STA may be requested to perform SDM Calculation)*
	CREW	**MONITOR** QPTR less than 1.02 **USING** one of the following: • ICS OR • 0-SI-NUC-000-133.0, Quadrant Power Tilt Ratio. *(If applicable RNO action N/A <50% power)*
	CREW	**NOTIFY** MSS to initiate maintenance for affected rod.
NOTE		Power range high flux trip setpoint must be reduced to less than or equal to 85% within four hours UNLESS dropped rod is restored. (LCO 3.1.3.1 action c). LCO 3.2.4 may require more limiting setpoint if QPTR exceeds 1.02.
	CREW	**NOTIFY** MIG to prepare to reduce high neutron flux trip setpoint to less than or equal to applicable value from LCO 3.1.3.1 or 3.2.4 **USING** 0-SI-IXX-092-N40.0.

Op Test No.: NRC Scenario # 1 Event # 3 Page 19 of 43

Event Description: Control Bank D Group 1 Dropped Rod (D-4)

Time	Position	Applicant's Actions or Behavior
	CREW	**PERFORM** notifications: a. **NOTIFY** Reactor Engineer. **[C.1] [C.3]** b. **COMPLETE** other notifications **USING** SPP-3.5, Regulatory Reporting Requirements. *(Typically delegated to Shift Manager)*
		CHECK the following: • repairs COMPLETE • ROD CONTROL URGENT FAILURE alarm NOT LIT. [M-4B, window A-6] *(RNO Required)* **PERFORM** the following: a. **NOTIFY** Reactor Engineering to perform 0-SI-NUC-000-126.0, *Hot Channel Factor Determination,* within 72 hours of rod misalignment (LCO 3.1.3.1.c.3.c) if realignment is NOT completed within 72 hour limit. b. **DO NOT CONTINUE** this section **UNTIL** repairs completed and urgent failure alarm clear.
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Op Test No.:	NRC	Scenario #	1	Event #	3	Page	20	of 43
Event Description:	Control Bank D Group 1 Dropped Rod (D-4)							

Time	Position	Applicant's Actions or Behavior

Lead Examiner may cue the next event when Tech Spec Evaluation Complete and SRO has determined that AOP-C.01 cannot continue until repairs complete.

Op Test No.: NRC Scenario # 1 Event # 4 & 5 Page 21 of 43

Event Description: Inadvertent Main Turbine Trip, Main Generator Fails to Trip

Time	Position	Applicant's Actions or Behavior

Console Operator: When directed, initiate Event 4

Indications available:

Main Turbine Trip:
- Alarm XA-55-4C (Turb 1st out) Window E-3 "ZS-47-24 AUTO STOP TURBINE TRIP"
- Steam Dump Valves Open
- Turbine Stop Valves Closed

Main Generator Fails to Trip:
- Alarm XA-55-1A Window B-1 "GENERATOR REVERSE POWER TRIP and Generator PCBs not Open

Evaluator Note: When turbine Trips the crew may attempt to manually trip the reactor even though it is not required. If Rx trip is attempted, an ATWS will occur and the crew will not enter AOP-S.06 for Turbine Trip. Therefore, most of the following event guide will not apply. Proceed to the next event guide for ATWS.

	Crew	Diagnose Turbine Trip with Rx Trip not Required
	RO	Monitor for Generator Breaker trip ~ 30 seconds after the Turbine trip. Open PCB when they fail to open. *(Should open as prudent action or AOP-S.06 will direct opening them at step 4)*
	SRO	Enter and direct actions of AOP-S.06
	BOP	**VERIFY** turbine TRIPPED: • **CHECK** turbine stop valves CLOSED.
	RO	**CHECK** reactor power less than 20%. *(RNO required)* **ENSURE** control rods inserting in AUTO or MANUAL to reduce Tave and power. *(Manual insertion required)*
	RO	**WHEN** reactor power is less than 20%, **THEN** **ENSURE** rod control in MANUAL.

Op Test No.: NRC Scenario # 1 Event # 4 & 5 Page 22 of 43

Event Description: Inadvertent Main Turbine Trip, Main Generator Fails to Trip

Time	Position	Applicant's Actions or Behavior
	BOP	**CHECK** main generator PCBs OPEN after 30 second time delay [M-1]. *(if not previously performed RNO Required)* **OPEN** main generator PCBs.
	BOP	**MONITOR** feedwater and condensate system: a. **CHECK** at least one Main Feedwater Pump RUNNING. b. **MONITOR** at least two Intermediate Pressure Feedwater Heaters IN SERVICE. (No more than one heater string isolation). c. **MONITOR** at least two Low Pressure Feedwater Heaters IN SERVICE. (No more than one heater string isolation).
	RO	**CHECK** S/G narrow range levels STABLE at or trending to program value.
	BOP/RO	**MAINTAIN** T-avg and reactor power **USING** manual rod control and steam dumps: a. **CHECK** steam dumps OPERATING to control T-avg. b. **CHECK** reactor power within steam dump and feedwater system capabilities.
	CREW	**ANNOUNCE** turbine trip **USING** PA system.

Lead Examiner may cue the next event when desired.

Op Test No.: NRC	Scenario # 1	Event # 6 & 7	Page 23 of 43
Event Description:	Remaining Control Bank D Group 1 Rods (M-4, M-12, D-12) Drop, ATWS		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 6 Note: If Crew attempts Rx Trip when turbine trips (Event 4), Event 6 will not be required to initiate ATWS.		
Indications Available: **Dropped Rods/ATWS:** • Rod Bottom lights lit for Rods M-4, M-12, D-12. • RPIs indicate Zero for Rods M-4, M-12, and D-12. • Alarm (Reactor 1st Out) XA-55-4D Window C-4 "NC-41U POWER RANGE HI NEUTRON FLUX RATE REACTOR TRIP • Alarm XA-55-6A Window B-1 "NC-41U/NC-41K NIS POWER RANGE HIGH NEUTRON FLUX RATE" • Both Reactor Trip Breakers Closed		
	RO	Identify ATWS after attempting both Rx trip Switches.
	CREW	Dispatch Personnel to locally Trip reactor as prudent action or later as directed by procedure.
	SRO	Enter and Direct actions of FR-S.1
CAUTION	**RCPs should NOT be tripped with reactor power greater than 5%.**	
NOTE	Steps 1 and 2 are immediate action steps.	

Op Test No.: NRC Scenario # 1 Event # 6 & 7 Page 24 of 43

Event Description: Remaining Control Bank D Group 1 Rods (M-4, M-12, D-12) Drop, ATWS

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 1 – Option 1	RO	**VERIFY** reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers OPEN or DISCONNECTED • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps. *(RNO Required)* **TRIP** reactor. **IF** reactor trip breakers will NOT open, **THEN** **MAINTAIN** auto or manual rod insertion at max achievable rate UNTIL rods are at bottom. *(Manual Rod Insertion will be required)* *Critical Task "Prior to completion of FR-S.1 step 4"*
	BOP	**VERIFY** turbine TRIPPED: • ALL turbine stop valves CLOSED.

Evaluator Note: If FR-S.1 entered directly without performance of AOP-S.06 BOP should Monitor and Open Generator Breakers >30 seconds after the Main Turbine Trip.

Op Test No.: NRC	Scenario # 1	Event # 6 & 7	Page 25 of 43
Event Description:	Remaining Control Bank D Group 1 Rods (M-4, M-12, D-12) Drop, ATWS		

Time	Position	Applicant's Actions or Behavior
	BOP	**CHECK** AFW System operation: a. MD AFW pumps RUNNING *(RNO)* a. **START** pumps. b. TD AFW pump RUNNING. *(RNO)* b. **IF** TD AFW pump is needed, **THEN** **PERFORM** the following: 1) **START** TDAFW pump. 2) **ENSURE** TDAFW pump steam supply established. c. MD AFW LCVs in AUTO. *(RNO)* c. **PLACE** AFW LCVs in AUTO or **OPEN** in MANUAL as necessary. d. TD AFW LCVs OPEN. *(RNO)* d. **IF** TD AFW pump is running, **THEN** **OPEN** TD AFW LCVs as necessary.

Op Test No.:	NRC	Scenario #	1	Event #	6 & 7	Page 26	of 43
Event Description:	Remaining Control Bank D Group 1 Rods (M-4, M-12, D-12) Drop, ATWS						

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 1 – Option 2	RO/BOP	**EMERGENCY BORATE** RCS by performing the following: a. **ENSURE** at least one CCP RUNNING. b. **INITIATE** Emergency Boration **USING** EA-68-4. • **PLACE** boric acid transfer pumps in fast speed. • **ADJUST** emergency borate valve **[FCV-62-138]** to obtain boric acid flow between 35 gpm and 150 gpm on **[FI-62-137A]**. • **MONITOR** emergency boration flow: **a. CHECK** emergency boration flow established on **[FI-62-137A]**. **b. IF** boric acid flow less than 35 gpm, **THEN (N/A)** *Critical Task "Prior to completion of FR-S.1 step 4"* c. **VERIFY** charging flow path established: • FCV-62-90 OPEN • FCV-62-91 OPEN • FCV-62-86 or FCV-62-85 OPEN. d. **CHECK** pressurizer pressure less than 2335 psig.
	RO	**VERIFY** Containment Purge isolated: a. **VERIFY** containment purge and vent dampers (System 30) CLOSED. [Panel 6K and 6L]

Op Test No.: NRC Scenario # 1 Event # 6 & 7 Page 27 of 43

Event Description: Remaining Control Bank D Group 1 Rods (M-4, M-12, D-12) Drop, ATWS

Time	Position	Applicant's Actions or Behavior
	CREW	**MONITOR** for SI signal: a. **CHECK** SI signal ACTUATED. *RNO* a. **IF** SI signal is required, **THEN** **ACTUATE** SI signal. **IF** SI signal is NOT required, **THEN** **GO TO** Step 7. *(SI should Not be required at this point)*
	RO/BOP	**CHECK** reactor and turbine trip status: a. Reactor TRIPPED. *(RNO May be required if not previously performed and Reactor still not tripped)* a. **PERFORM** the following: 1) **DISPATCH** personnel to locally open reactor trip breakers and MG set output breakers [MG Set Room, Aux Bldg el. 759]. 2) **DISPATCH** personnel to locally open breakers to MG sets [480V Unit Boards A and B]. b. Turbine TRIPPED: • ALL turbine stop valves CLOSED.
		MONITOR reactor subcritical: a. Power range channels less than 5%. b. Intermediate range SUR NEGATIVE. c. **GO TO** Step 19.

Op Test No.: NRC Scenario # 1 Event # 6 & 7 Page 28 of 43

Event Description: Remaining Control Bank D Group 1 Rods (M-4, M-12, D-12) Drop, ATWS

Time	Position	Applicant's Actions or Behavior
	SRO	**ENSURE** status tree monitoring initiated.
	BOP	**MAINTAIN** S/G narrow range levels: a. Greater than 10% [25% ADV]. b. Between 10% [25% ADV] and 50%.
	SRO/RO	**MONITOR** boration termination criteria: a. **NOTIFY** Chem Lab to sample RCS boron concentration. b. **CHECK** for all of the following: • all control rods FULLY INSERTED • RCS temperature greater than 540°F • no RCS dilution has occurred. c. **WHEN** emergency boration is no longer needed, **THEN** **STOP** emergency boration **USING** EA-68-4, Emergency Boration.
		RETURN TO procedure and step in effect. *(SRO should return to E-0)*

When Crew Returns to E-0 Lead Examiner may cue the next event.

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 29 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior

Console Operator: When directed, initiate Event 8

Indications available:

Loop 3 Main Feedwater line Break Inside Containment:

- Alarm XA-55-5C Window B-3 "MS-30-241 LOWER COMPT MOISTURE HI
- Alarm XA-55-6E Window C-6 "ZS-61-186 ICE CONDENSER LOWER INLET DOOR OPEN
- Containment Pressure Increasing
- Containment Radiation Not Increasing

Hi-Hi Containment Pressure Phase B Auto failure:

- Containment Spray Pumps Auto Start from containment pressure ≥2.81 psi.
- MSIV Closure if not manually closed
- Phase B status lights not green on panels 6K and 6L (M-6)

	CREW	Diagnose Secondary Side Break inside containment and ensure Safety Injection actuated.
	SRO	Direct actions of E-0

Evaluator Note: Crew may manually close MSIVs based on foldout page of E-0 if Hi-Hi containment pressure signal does not close them first. AFW to Faulted S/G may also be isolated per the Foldout Page.

Evaluator Note: At some point during performance of E-0, FR-Z.1 may be entered due to High containment pressure since status tree monitoring is already in effect due to transition to FR-S.1 for ATWS. **FR-Z.1 steps are included in this event guide (Page 35)** at the transition to E-2. Entry into FR-Z.1 should be brief for a Secondary break.

NOTE 1: Steps 1 through 4 are immediate action steps.

NOTE 2: This procedure has a foldout page.

Op Test No.: NRC Scenario # 1 Event # 8 & 9 Page 30 of 43

Event Description: Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure

Time	Position	Applicant's Actions or Behavior
	RO	**VERIFY** reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps. • Neutron flux DROPPING
	BOP	**VERIFY** turbine TRIPPED: • Turbine stop valves CLOSED.
	BOP	**VERIFY** at least one train of shutdown boards ENERGIZED.
	RO	**DETERMINE** if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D].
	BOP	**PERFORM** ES-0.5, Equipment Verifications WHILE continuing in this procedure. *(ES-0.5 At end of Scenario)* *(Note: If Phase B Failure not already identified and corrected it will be addressed during performance of ES-0.5)*

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 31 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
	BOP	**DETERMINE** if secondary heat sink available: a. **CHECK** total AFW flow greater than 440 gpm. b. **CHECK** narrow range level greater than 10% [25% ADV] in at least one S/G. c. **CONTROL** feed flow to maintain narrow range level between 10% [25% ADV] and 50% in intact or ruptured S/Gs. *(If not previously performed AFW to faulted S/G may be isolated at this step)*
	BOP/RO	**CHECK** if main steam lines should be isolated: a. **CHECK** if any of the following conditions have occurred: • Any S/G pressure less than 600 psig. **OR** • Any S/G pressure dropping UNCONTROLLED. **OR** • Phase B actuation. b. **ENSURE** MSIVs and MSIV bypass valves CLOSED. *(MSIVs will be closed if not previously performed)* c. **ENSURE** applicable Foldout Page actions COMPLETED. *(Applicable Foldout Page actions include Tripping the RCPs and Isolating AFW to Faulted S/G #3 if not previously performed)*

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 32 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK** RCP trip criteria: a. **CHECK** the following: • RCS pressure less than 1250 psig **AND** • At least one CCP **OR** SI pump RUNNING. *(RCPs will likely already be stopped)*
	RO/BOP	**MONITOR** RCS temperatures: • **IF** any RCP running, **THEN** **CHECK** T-avg stable at or trending to between 547°F and 552°F. *(RCP will likely be off due to Phase B)* **OR** • **IF** RCPs stopped, **THEN** **CHECK** T-cold stable at or trending to between 547°F and 552°F. *(If No Perform RNO – Next Page)*

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 33 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
		(RNO) **IF** temperature less than 547°F and dropping, **THEN** **PERFORM** the following: a. **ENSURE** steam dumps and atmospheric reliefs CLOSED. b. **IF** cooldown continues, **THEN** **CONTROL** total feed flow: 1) **ENSURE** total AFW flow less than or equal to 600 gpm. 2) **MAINTAIN** total AFW flow greater than 440 gpm UNTIL narrow range level is greater than 10% [25% ADV] in at least one S/G.
	RO	**CHECK** pressurizer PORVs, safeties, and spray valves: a. Pressurizer PORVs CLOSED. b. Pressurizer safety valves CLOSED. c. Normal spray valves CLOSED. d. Power to at least one block valve AVAILABLE. e. At least one block valve OPEN.

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 34 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
	BOP	**DETERMINE** if S/G secondary pressure boundaries are INTACT: • **CHECK** all S/G pressures CONTROLLED or RISING. • **CHECK** all S/G pressures greater than 140 psig. *(RNO)* **PERFORM** the following: a. **MONITOR** status trees. b. **GO TO** E-2, Faulted Steam Generator Isolation. *(Transition to E-2)*

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 35 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
Evaluator Note: Applicable **FR-Z.1** Steps are included next prior to E-2 Steps. If FR-Z.1 previously performed, continue to E-2 Steps that follow.		
NOTE		If this procedure has been entered for an orange path and performance of ECA-1.1 (Loss of RHR Sump Recirculation) is required, FR-Z.1 may be performed concurrently with ECA-1.1.
	RO	**MONITOR** RWST level greater than 27%.
	RO	**VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN • Panel 6L PHASE B GREEN. *(Note: If Phase B Failure not already identified and corrected it should be manually actuated at this step)*
	RO	**ENSURE** RCPs STOPPED.
		DETERMINE if this procedure should be exited: a. **CHECK** for faulted S/G: • Any S/G pressure DROPPING in an uncontrolled manner **OR** • Any S/G pressure less than 140 psig. b. **CHECK** containment pressure less than 12 psig. c. **CHECK** at least one containment spray pump RUNNING and delivering flow. d. **CHECK** at least one containment air return fan RUNNING. e. **RETURN** to procedure and step in effect. *(SRO return to E-0 or E-2 as applicable)*

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 36 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
	SRO	Enter and Direct actions of **E-2**
CAUTION	**Unisolating a faulted S/G or secondary break should NOT be considered UNLESS needed for RCS cooldown.**	
CRITICAL Task 2 Part 1	BOP	**CHECK** MSIVs and MSIV bypass valves CLOSED. *(RNO if not previously performed)* **CLOSE** valves. *(Critical Task "Prior to completion of E-2")*
	BOP	**CHECK** ANY S/G secondary pressure boundary INTACT: • Any S/G pressure CONTROLLED or RISING.
	BOP	**IDENTIFY** Faulted S/G(s): a. **CHECK** S/G pressures: • Any S/G pressure DROPPING in an uncontrolled manner. **OR** • Any S/G pressure less than 140 psig.
CAUTIONS	• **Secondary heat sink requires at least one S/G available.** • **Isolating both steam supplies to the TD AFW pump when it is the only source of feed flow will result in loss of secondary heat sink.**	

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 37 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 2 – PART 2	BOP	**ISOLATE** Faulted S/G(s): • **ISOLATE** MFW. • **ISOLATE** AFW. • **CLOSE** TD AFW pump steam supply from faulted S/G FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4). • **VERIFY** S/G blowdown valves CLOSED. • **VERIFY** atmospheric relief CLOSED. *(Critical Task: "Prior to completion of E-2")*
	BOP	**CHECK** CST level greater than 5%.
	CREW	**VERIFY** secondary radiation NORMAL: a. **CHECK** secondary radiation NORMAL **USING** Appendix A, Secondary Rad Monitors. (App. A also contained in ES-0.5) b. **NOTIFY** Chem Lab to take S/G activity samples. c. **WHEN** Chem Lab is ready to sample S/Gs, **THEN** **PERFORM** the following: 1) **ENSURE** FCV-15-43 Blowdown Flow Control valve CLOSED. 2) **ENSURE** Phase A signal RESET. 3) **OPEN** blowdown isolation valves. d. **NOTIFY** RADCON to survey main steam lines and S/G blowdown.

Op Test No.: NRC	Scenario # 1	Event # 8 & 9	Page 38 of 43
Event Description:	Loop 3 Feedwater Line Break In Containment, Phase B Cntmnt Isol Auto Failure		

Time	Position	Applicant's Actions or Behavior
	CREW	**CHECK** SI termination criteria: a. RCS subcooling based on core exit T/Cs greater than 40°F. b. Secondary heat sink: • Narrow range level in at least one Intact S/G greater than 10% [25% ADV] **OR** • Total feed flow to Intact S/Gs greater than 440 gpm. c. RCS pressure stable or rising. d. Pressurizer level greater than 10% [20% ADV]. e. **GO TO** ES-1.1, SI Termination.

Lead Examiner may terminate Scenario when Crew transitions to ES-1.1.

Op Test No.: NRC Scenario # 1 Event # ES-0.5 Page 39 of 43

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5 Actions
		VERIFY D/G ERCW supply valves OPEN.
	BOP	**VERIFY** at least four ERCW pumps RUNNING.
	BOP	**VERIFY** CCS pumps RUNNING: • Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	**VERIFY** EGTS fans RUNNING.
	BOP	**VERIFY** generator breakers OPEN.
	BOP	**VERIFY** AFW pumps RUNNING: • MD AFW pumps • TD AFW pump.
		NOTE AFW level control valves should NOT be repositioned if manual action has been taken to control S/G levels, to establish flow due to failure, or to isolate a faulted S/G.
	BOP	**CHECK** AFW valve alignment: a. **VERIFY** MD AFW LCVs in AUTO. b. **VERIFY** TD AFW LCVs OPEN. c. **VERIFY** MD AFW pump recirculation valves FCV-3-400 and FCV-3-401 CLOSED.

Op Test No.: NRC Scenario # 1 Event # ES-0.5 Page 40 of 43

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** MFW Isolation: • MFW pumps TRIPPED • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	**MONITOR** ECCS operation: **VERIFY** ECCS pumps RUNNING: • CCPs • RHR pumps • SI pumps **VERIFY** CCP flow through CCPIT. **CHECK** RCS pressure less than 1500 psig. **VERIFY** SI pump flow. **CHECK** RCS pressure less than 300 psig. **VERIFY** RHR pump flow.

Op Test No.: NRC	Scenario # 1	Event # ES-0.5	Page 41 of 43
Event Description: Equipment Verifications			

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** ESF systems ALIGNED: • Phase A ACTUATED: o PHASE A TRAIN A alarm LIT [M-6C, B5]. o PHASE A TRAIN B alarm LIT [M-6C, B6]. • Containment Ventilation Isolation ACTUATED: o CONTAINMENT VENTILATION ISOLATION TRAIN A alarm LIT [M-6C, C5]. o CONTAINMENT VENTILATION ISOLATION TRAIN B alarm LIT [M-6C, C6]. • Status monitor panels: o 6C DARK o 6D DARK o 6E LIT OUTSIDE outlined area o 6H DARK o 6J LIT. • Train A status panel 6K: o CNTMT VENT GREEN o PHASE A GREEN • Train B status panel 6L: o CNTMT VENT GREEN o PHASE A GREEN

Op Test No.: NRC	Scenario # 1	Event # ES-0.5	Page 42 of 43
Event Description: Equipment Verifications			

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** for containment spray and Phase B actuation: a. **CHECK** for any of the following: • Phase B ACTUATED **OR** • Containment pressure greater than 2.8 psig. b. **VERIFY** containment spray INITIATED: 1) Containment spray pumps RUNNING. 2) Containment spray header isolation valves FCV-72-39 and FCV-72-2 OPEN. 3) Containment spray recirculation valves to RWST FCV-72-34 and FCV-72-13 CLOSED. 4) Containment spray header flow greater than 4750 gpm per train. 5) Panel 6E LIT. c. **VERIFY** Phase B ACTUATED: • PHASE B TRAIN A alarm LIT [M-6C, A5]. • PHASE B TRAIN B alarm LIT [M-6C, A6]. *(If not previously performed, Manual Phase B Containment Isolation should be actuated at this point)* d. **ENSURE** RCPs STOPPED. *(Step continued in next Table Cell)*

Op Test No.: NRC Scenario # 1 Event # ES-0.5 Page 43 of 43

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	e. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN. • Panel 6L PHASE B GREEN. f. **CHECK** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48. g. **WHEN** 10 minutes have elapsed, **THEN** **ENSURE** containment air return fans RUNNING.
	BOP	CHECK secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors • Appendix B, Containment Rad Monitors.
	BOP	**VERIFY** pocket sump pumps STOPPED: [M-15, upper left corner] • HS-77-410, Rx Bldg Aux Floor and Equipment Drain Sump pump A • HS-77-411, Rx Bldg Aux Floor and Equipment Drain Sump pump B.
	BOP	**DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	**ENSURE** plant announcement has been made regarding Reactor Trip and SI.

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Sim. Setup	Reset **IC- 188** Perform switch check. Allow the simulator to run for at least 3 minutes before loading SCEN file or starting the exercise. This will initialize ICS. **Load SCENS: NRC09A** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms.	Initialize simulator at 24 % RTP. **Place Mode 1 placard on panels.** **Place A Train Week sign on the simulator**
Active when SCENS loaded	imf RH01A f:1 ior ZLOHS7410A_GREEN f:0	1A-A RHR PUMP INOPERABLE. ***PLACE 1A-A RHR PUMP HS IN PTL AND TAG WITH HOLD ORDER.*** ***Place Protected equipment tags on B Train RHR Pump, SI Pump, Charging Pump, and Containment Spray Pump***
Event 1		INCREASE POWER
Event 2 When Power change complete as Directed by Lead Examiner Insert: **Key-1**	imf RX06B f:1 k:1	PZR LEVEL TRANSMITTER FAILS LOW CHNL 2 68-335 ***If MSS or MIG contacted to trip Bistables, inform the crew that IMs will report to the MCR in ~45 minutes.***
Event 3 When LT AOP and Tech Spec Eval complete as Directed by Lead Examiner Insert: **Key-2**	imf RD07D4 f:1 k:2	DROPPED ROD D-4 (Rx Trip Not required) ***If dispatched to investigate at Rod control panels report no obvious problem. Need maintenance to investigate. Report in ~5 min.*** ***If MSS contacted to initiate maintenance respond maintenance personnel will report to the MCR in ~30 min.***
Event 4 When Rod AOP and Tech Spec Eval complete as Directed by Lead Examiner Insert: **Key-3**	irf TCR02 f:2 k:3	Inadvertent turbine trip. ***IF DISPATCHED to investigate wait ~2 min THEN report maintenance personnel inadvertently bumped local trip device.***

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Event 5 Active when SCENS loaded	Imf EG07 f:1	MAIN GENERATOR TRIP FAILURE (Gen PCBs can be manuallay opened)
Event 6 When crew Announces Turbine Trip Using PA system (AOP-S.06, Step 8) as Directed by Lead Examiner Insert: **Key-4**	imf RD07M4 f:1 k:4 imf RD07M12 f:1 k:4 imf RD07D12 f:1 k:4	DROPPED ROD M-4 DROPPED ROD M-12 DROPPED ROD D-12 Note: Simulates dropping remainder of rods in the group to require Rx Trip.
Event 7 Active when SCENS loaded	imf RP01C f:1	BOTH RX TRIP BKRS FAIL TO OPEN (ATWS)
When dispatched to open Reactor Trip Breakers locally, wait ~3 min (Note: Delay as necessary until Emergency Boration is initiated) and insert: **Key-5**	irf RPR05A f:1 k:5 irf RPR05B f:1 k:5	RX TRIP BREAKER A MANUAL TRIP RX TRIP BREAKER B MANUAL TRIP Note: Simulates personnel opening reactor trip breakers locally.
Event 8 When FR-S.1 Complete as Directed by Lead Examiner Insert: **Key-6**	imf FW23C f:25 r:120 k:6	LOOP 3 FEEDWATER LINE BREAK INSIDE CNTMT.
Event 9 Active when SCENS loaded	imf RP07 f:1	FAILURE OF HI-HI CNTMT PRESS LOGIC TO INITIATE PHASE B CNTMT ISOLATION.

Time: Now Date: Today

Unit 1 MCR Checklist (751-2428 ID 7636)

Part 1 - Completed by Off-going Shift / Reviewed by On-coming Shift

Mode 1, 24% Power 175 MWe **PSA Risk: Green** **Grid Risk: Green** **RCS Leakage ID .02 gpm, UNID .01 gpm** **Cumulative Purge Time 50.5 Hours**	**NRC phone Authentication Code** **Until 0800 H3H8** **After 0800 42DF**

Common Tech Spec Actions

-

U-1 Tech Spec Actions

- ***LCO 3.5.2 & 3.6.2.1 - 1A-A RHR pump has been tagged for 6 hours for maintenance to perform motor winding test. Expected Return to service is ~2 hours.***

Protected Equipment

- **1B-B RHR Pump**
- **1B-B Safety Injection Pump**
- **1B-B Charging Pump**
- **1B-B Containment Spray Pump**

Shift Priorities

- Plant Startup was suspended at ~24% for repairs to Loop #2 MFW Reg valve. Loop #2 MFW REG Valve repairs and associated PMTs are now complete. Continue power increase to 100% per Reactor Engineer SpreadSheet. Spreadsheet has been verified by the SRO/STA and 0-SO-62-7 Appendix D and E have been performed. Currently in 0-GO-4, Section 5.5, step [21]. Pre-Conditioned power level is 100%. Confirmation from Chemistry to exceed 30% reactor power has been obtained.

Part 2 – Performed by on-coming shift

☒ Verify your current qualifications	☒ Review Operating Log since last held shift or 3 days, whichever is less	
☒ Standing Orders / Shift Orders	☒ TACF	☒ Immediate required reading
☒ LCO Actions		

Part 3 – Performed by both off-going and on-coming shift

☒ Walk down of MCR Control Boards

Time: Now Date: Today

MAIN CONTROL ROOM (7690)
• **Train_A_Week**
OUTSIDE (7666) [593-5214]
•
AUXILIARY BUILDING (7775)
• ***1A-A RHR pump has been tagged for 6 hours for maintenance to perform motor winding test. Expected Return to service is ~2 hours.***
TURBINE BUILDING (7771) (593-8455)
•

Time: Now Date: Today

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number	Date Scheduled

MCR WO List

ID And Noun Name	Panel	Problem Description	WO/PER Number	Date Scheduled

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1475** ppm Today		BA Controller Setpoint: **38%** *	RCS B-10 Depletion: **2** ppm
Operable BAT: **A**	BAT A Boron: **6850** ppm	BAT C Boron: **6850** ppm	RWST Boron: **2601** ppm
Nominal Gallons per rod step from 219: **7** gallons of acid, **36** gallons of water			

* Verify boric acid flow controller is set at Adjusted BA Controller Setting iaw 0-SO-62-7 section 5.1

Estimated values for a 1° Change in Tave **

Gallons of acid: **26**	Gallons of water: **138**	Rod Steps: **4**

Estimated rods/boron for emergency step power reduction **

(Assuming Xenon equilibrium and no reactivity effects due to Xenon. 2/3 total reactivity from rods, 1/3 from boron)

Power reduction amount	Estimated Final Rod Position	Estimated boron addition
10%	**198** Steps on bank D	**101** gallons
30%	**174** Steps on bank D	**295** gallons
50%	**152** Steps on bank D	**485** gallons

** These values are approximations and not intended nor expected to be exact. The values may be superseded by Rx Engineering or SO-62-7 calculated values. These values are calculated assuming 100% steady state power operation only. Engineering data last updated **one week ago**. Data Valid until **one week from now**.

Previous Shift Reactivity Manipulations

Number of dilutions: 0	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 0	Gallons per boration: 0	Rod steps out: 0
Total amount diluted: 0	Total amount borated: 0	Net change: 0 IN/Out

Current Shift Estimated Reactivity Manipulations

Number of dilutions: ***	Number of borations: ***	Rod steps in: ***
Gallons per dilution: ***	Gallons per boration: ***	Rod steps out: ***
Total expected dilution: ***	Total expected boration: ***	Net change: *** In/Out

Remarks:

Rx Power – 24% MWD/MTU – 1000 Xenon & Samarium at Equilibrium

***Per Reactor Engineering Spreadsheet.

Next Unit 1 Flux Map is scheduled - <u>three weeks from now</u>

Unit 1 M-P is 0 PPM

Unit Supervisor: _____

Name/Date

Operations Chemistry Information

Boron Results					
Sample Point	**Units**	**Boron**	**Date / Time**	**Goal**	**Limit**
U1 RCS	ppm	1475	Today / Now	Variable	Variable
U2 RCS	ppm	816	Today / Now	Variable	Variable
U1 RWST	ppm	2601	Today / Now	2550 - 2650	2500 - 2700
U2 RWST	ppm	2569	Today / Now	2550 - 2650	2500 - 2700
BAT A	ppm	6850	Today / Now	Variable	Variable
BAT B	ppm	6850	Today / Now	Variable	Variable
BAT C	ppm	6850	Today / Now	Variable	Variable
U1 CLA #1	ppm	2556	Today / Now	2470-2630	2400-2700
U1 CLA #2	ppm	2575	Today / Now	2470-2630	2400-2700
U1 CLA #3	ppm	2591	Today / Now	2470-2630	2400-2700
U1 CLA #4	ppm	2589	Today / Now	2470-2630	2400-2700
U2 CLA #1	ppm	2531	Today / Now	2470-2630	2400-2700
U2 CLA #2	ppm	2650	Today / Now	2470-2630	2400-2700
U2 CLA #3	ppm	2522	Today / Now	2470-2630	2400-2700
U2 CLA #4	ppm	2526	Today / Now	2470-2630	2400-2700
Spent Fuel Pool	ppm	2547	Today / Now	≥ 2050	≥ 2000
Lithium Results				**Goal**	**Midpoint**
U1 RCS Lithium	ppm	1.1	Today / Now	>1	>1
U2 RCS Lithium	ppm	2.43	Today / Now	2.18-2.48	2.33

Primary to Secondary Leakrate Information (Total CPM RM-90-99/119)					
Indicator	**Units**	**U1**	**Date / Time**	**U2**	**Date/Time**
SI 50 S/G Leakage?	Yes/No	No	Today / Now	No	Today / Now
SI 137.5 CVE Leakrate	gpd	< 0.1	Today / Now	< 0.1	Today / Now
5 gpd leak equivalent	cpm	380	Today / Now	68	Today / Now
30 gpd leak equivalent	cpm	1980	Today / Now	83	Today / Now
50 gpd leak equivalent	cpm	3250	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	4850	Today / Now	455	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cpm	50	Today / Now	40	Today / Now
Correction Factor 99/119	cpm/gpd	10.69	Today / Now	14.13	Today / Now

Steady state conditions are necessary for an accurate determination of leak rate using the CVE Rad Monitor

Unit 1

DELTA TIME (hrs)	REACTOR POWER (%)	POWER DEFECT (pcm)	ASSUMED ROD HT (steps)	INSERTED WORTH (pcm)	EXPECTED XENON (pcm)	DELTA RHO BORON (pcm)	BORON CONC (ppm)	DELTA PPM (ppm)	RECOMMEND DILUTION (gal)	RECOMMEND BORATION (gal)	IODINE CONC (% eq)	DATE/TIME
0	24.0	376.0	175.0	-350.8	-1537.0	---	1475.0	---	---	---	24.2	Today
1	34.0	553.0	191.0	-230.4	-1514.3	37.0	1473.2	-5.9	252	0	24.7	Today
2	44.0	714.9	201.0	-129.0	-1478.9	23.0	1471.5	-4.1	183	0	26.1	Today
3	54.0	859.9	216.0	-30.7	-1439.1	6.9	1470.3	-1.1	49	0	28.4	Today
4	64.0	1003.0	216.0	-29.1	-1401.7	104.0	1453.6	-16.7	741	0	31.4	Today
5	74.0	1151.8	216.0	-27.5	-1371.7	117.2	1434.8	-18.8	846	0	35.1	Today
6	84.0	1304.9	216.0	-25.8	-1352.6	132.4	1413.5	-21.3	968	0	39.4	Today
7	94.0	1463.3	216.0	-24.0	-1346.4	150.4	1389.4	-24.1	1119	0	44.3	Today
8	100.0	1566.2	216.0	-23.0	-1356.7	112.2	1371.4	-18.0	845	0	49.5	Today
9	100.0	1574.3	216.0	-23.0	-1388.9	40.3	1364.9	-6.5	305	0	54.5	Today
10	100.0	1577.2	216.0	-23.0	-1440.7	54.7	1356.2	-8.8	417	0	58.9	Today
11	100.0	1581.1	216.0	-23.0	-1505.0	68.2	1345.2	-10.9	524	0	63.0	Today
12	100.0	1586.0	216.0	-23.0	-1576.4	76.4	1333.0	-12.2	592	0	66.6	Today
13	100.0	1591.5	216.0	-23.0	-1651.3	80.4	1320.1	-12.9	628	0	69.9	Today
14	100.0	1597.2	216.0	-23.0	-1726.9	81.3	1307.1	-13.0	642	0	72.9	Today
15	100.0	1603.1	216.0	-23.0	-1801.2	80.2	1294.3	-12.8	639	0	75.5	Today
16	100.0	1608.9	216.0	-23.0	-1873.0	77.6	1281.8	-12.4	625	0	77.9	Today
17	100.0	1614.6	216.0	-23.0	-1941.4	74.1	1270.0	-11.9	602	0	80.1	Today
18	100.0	1620.1	216.0	-23.0	-2005.9	70.0	1258.8	-11.2	574	0	82.1	Today
19	100.0	1625.2	216.0	-23.0	-2066.3	65.5	1248.3	-10.5	542	0	83.8	Today
20	100.0	1630.0	216.0	-23.0	-2122.4	61.0	1238.5	-9.7	508	0	85.4	Today
21	100.0	1634.5	216.0	-23.0	-2174.4	56.4	1229.5	-9.0	473	0	86.8	Today
22	100.0	1638.7	216.0	-23.0	-2222.2	52.0	1221.2	-8.3	438	0	88.1	Today
23	100.0	1642.5	216.0	-23.0	-2266.1	47.7	1213.6	-7.6	405	0	89.3	Today
24	100.0	1646.0	216.0	-23.0	-2306.2	43.7	1206.6	-7.0	373	0	90.4	Today
25	100.0	1649.2	216.0	-23.0	-2342.9	39.9	1200.2	-6.4	342	0	91.3	Today
26	100.0	1652.1	216.0	-23.0	-2376.3	36.4	1194.4	-5.8	313	0	92.2	Today
27	100.0	1654.9	216.0	-23.0	-2406.7	33.1	1189.1	-5.3	287	0	92.9	Today
28	100.0	1657.3	216.0	-23.0	-2434.4	30.1	1184.3	-4.8	262	0	93.6	Today
29	100.0	1659.6	216.0	-23.0	-2459.5	27.3	1180.0	-4.4	238	0	94.3	Today
30	100.0	1661.6	216.0	-23.0	-2482.2	24.8	1176.0	-4.0	217	0	94.8	Today
31	100.0	1663.5	216.0	-23.0	-2502.8	22.5	1172.4	-3.6	197	0	95.3	Today
32	100.0	1665.1	216.0	-23.0	-2521.4	20.3	1169.2	-3.2	179	0	95.8	Today
33	100.0	1666.7	216.0	-23.0	-2538.3	18.4	1166.2	-2.9	162	0	96.2	Today
34	100.0	1668.0	216.0	-23.0	-2553.6	16.6	1163.6	-2.7	147	0	96.6	Today
35	100.0	1669.3	216.0	-23.0	-2567.4	15.0	1161.2	-2.4	133	0	96.9	Today
36	100.0	1670.4	216.0	-23.0	-2579.8	13.6	1159.0	-2.2	121	0	97.2	Today

37	100.0	1671.4	216.0	-23.0	-2591.1	12.3	1157.1	-2.0	109	0	97.5	Today
38	100.0	1672.3	216.0	-23.0	-2601.3	11.1	1155.3	-1.8	99	0	97.7	Today
39	100.0	1673.2	216.0	-23.0	-2610.4	10.0	1153.7	-1.6	89	0	98.0	Today
40	100.0	1673.9	216.0	-23.0	-2618.7	9.0	1152.3	-1.4	81	0	98.2	Today
41	100.0	1674.6	216.0	-23.0	-2626.2	8.2	1151.0	-1.3	73	0	98.3	Today
42	100.0	1675.2	216.0	-23.0	-2632.9	7.4	1149.8	-1.2	66	0	98.5	Today
43	100.0	1675.7	216.0	-23.0	-2639.0	6.6	1148.7	-1.1	59	0	98.7	Today
44	100.0	1676.2	216.0	-23.0	-2644.5	6.0	1147.8	-1.0	54	0	98.8	Today
45	100.0	1676.7	216.0	-23.0	-2649.5	5.4	1146.9	-0.9	48	0	98.9	Today
46	100.0	1677.1	216.0	-23.0	-2653.9	4.9	1146.1	-0.8	44	0	99.0	Today
47	100.0	1677.4	216.0	-23.0	-2658.0	4.4	1145.4	-0.7	39	0	99.1	Today
48	100.0	1677.8	216.0	-23.0	-2661.6	4.0	1144.8	-0.6	36	0	99.2	Today
49	100.0	1678.1	216.0	-23.0	-2664.9	3.6	1144.2	-0.6	32	0	99.3	Today
50	100.0	1678.3	216.0	-23.0	-2667.9	3.2	1143.7	-0.5	29	0	99.3	Today
51	100.0	1678.6	216.0	-23.0	-2670.5	2.9	1143.2	-0.5	26	0	99.4	Today
52	100.0	1678.8	216.0	-23.0	-2672.9	2.6	1142.8	-0.4	24	0	99.5	Today
53	100.0	1679.0	216.0	-23.0	-2675.1	2.4	1142.4	-0.4	21	0	99.5	Today
54	100.0	1679.2	216.0	-23.0	-2677.1	2.1	1142.1	-0.3	19	0	99.6	Today
55	100.0	1679.3	216.0	-23.0	-2678.8	1.9	1141.8	-0.3	17	0	99.6	Today
56	100.0	1679.5	216.0	-23.0	-2680.4	1.7	1141.5	-0.3	16	0	99.6	Today
57	100.0	1679.6	216.0	-23.0	-2681.8	1.6	1141.3	-0.2	14	0	99.7	Today
58	100.0	1679.7	216.0	-23.0	-2683.1	1.4	1141.1	-0.2	13	0	99.7	Today

1000	MWD/MTU	Hold Tavg = Tref +/- 1.5F	Total	16893 0
6850	BAT ppm			

Small hourly boration/dilution volumes may be accumulated for larger single additions

Reason for Maneuver: Plant Startup
Date: Today
RxEng Name:
Comments:

APPENDIX E
Page 1 of 18

REACTIVITY BALANCE CALCULATION

NOTE 1 One calculation is required for each major change. Calculation is an approximation of required Boron change. Eyeball interpolation of graphs is expected.

NOTE 2 Dilution or Boration value for power change from P_1 % to P_2 % power in time period T with rods moving from step position R_1 to R_2. (Subscript convention: 1 = current point, 2 = target point)

[1] ENTER the following data:

DATA REQUIRED	DATA	Where To Get
Current RCS Boron	1475 ppm	Chem Lab or Estimate using Appendix O
Core Burnup	1000 MWD/MTU	ICS U0981
Current Reactor power	24 %	NIS or ICS
Final Reactor power	44 %	As required for plant conditions
Total Reactor Power change	20 Δ%	Δ Current and final Reactor power
Rate of Reactor power change	10 %/hr	As required for plant conditions
Number of hours to change power	2 hr(s)	As required for plant conditions
Current Rod Position	175 steps	ICS or MCR Board
Final Rod Position	201 steps	Estimate number of rod steps required to control ΔI and rod withdrawal requirements for power change.

APPENDIX E
Page 2 of 18

CAUTION **Follow sign conventions explicitly. (See Example Power Increase and Power decrease.)**

[2] CALCULATE change in boron concentration by performing the following:

Parameter	Where To Get	Calculation	Value
[a] $\Delta\rho_{\text{POWER DEFECT}}$	Attached Power Defect Curves: Unit 1: Figure 1, 2, or 3 Unit 2: Figure 8, 9, or 10.	380 pcm PD_1 - 700 pcm PD_2 = (current)	-320 pcm $\Delta\rho_{\text{POWER DEFECT}}$ (negative for power increase)
[b] $\Delta\rho_{\text{XENON}}$	$Xenon_1$: From ICS* or REACTF (either current conditions or projection to initial condition). $Xenon_2$: From ICS* or REACTF (projection over time period T). *(ICS Xenon values must add negative sign).	**NOTE:** Xenon reactivity must be negative -1480 pcm XE_2 -(-1540) pcm XE_1 = (current)	60 pcm $\Delta\rho_{\text{XENON}}$ (negative for rise in Xenon conc)
[c] $\Delta\rho_{\text{RODS}}$	Attached Rod Worth Curves: Unit 1: Figure 4, 5, or 6 Unit 2: Figure 11, 12, or 13.	-140 pcm $Rods_2$ -(-340) pcm $Rods_1$ = (current)	200 pcm $\Delta\rho_{\text{RODS}}$ (negative for rod insertion)

[d] $\Delta\rho_{\text{POWER DEFECT + XENON + RODS}}$ (CHANGE IN REACTIVY DUE TO POWER DEFECT, XENON, AND RODS) -60 pcm

[a] pcm $\Delta\rho$ POWER DEFECT + [b] pcm $\Delta\rho$ XENON + [c] pcm $\Delta\rho$ RODS =

[e] $\Delta\rho_{\text{BORON}}$ (CHANGE IN BORON REACTIVITY) 60 pcm $\Delta\rho$ BORON

([d] pcm $\Delta\rho_{\text{POWER DEFECT + XENON + RODS}}$) X (-1) =

[f] $\Delta ppm_{\text{BORON}}$ (CHANGE IN BORON CONCENTRATION)

([e] pcm $\Delta\rho$ BORON) ÷ (-6.21 pcm/ppm Boron Worth) = -9.7 ppm (negative for dilution, positive for boration)

from Fig. 7 (U-1) or Fig. 14 (U-2)

[3] ENSURE independently verified by SRO in accordance with Appendix J.
(N/A if performed by an SRO to verify data provided by Rx. Eng) N/A

APPENDIX D

Page 1 of 1

CALCULATION FOR AMOUNT OF BORIC ACID OR PRIMARY WATER (TI-44)

NOTE 1 One calculation is required for each major change.

NOTE 2 Boric acid amounts to achieve required RCS boron concentration may be significantly higher than calculated amounts if CVCS demin resins are removing boron. Amount of boron removal by mixed bed resins will depend on RCS boron, resin age, whether demin bed was previously borated, and letdown temperature. Chemistry should be consulted if required to evaluate resin bed removal.

[1] **IF** REACTF not used,
THEN
CALCULATE amount of primary water or boric acid required using TI-44.

RCS BORON	PPM CHANGE	AMOUNT PRIMARY WATER OR BORIC ACID
_____ppm Current		
_____ppm Target		
		TOTAL GAL(s)

NOTE REACTF data sheets are to be signed by the preparer and reviewer.

[2] **IF** REACTF used attach printout to procedure. ☑

NOTE IV is not required if appendix is performed by an SRO to verify data provided by Rx. Eng.

[3] **ENSURE** independently verified by an SRO in accordance with Appendix I. N/A
Initials

END OF TEXT

[REACTF - VERS SQ2.1]

BORATION / DILUTION CALCULATION
SEQUOYAH UNIT 1 CYCLE 16

RCS AVG TEMP	560.0 DEG F	RCS PRESSURE	2235.0 PSIG
PZR LEVEL	39.4 %	MAKEUP WTR CONC	.0 PPM
		BORIC ACID CONC	6820.0 PPM

INITIAL BORON CONC (PPM)	CONC CHANGE (PPM)	FINAL BORON CONC (PPM)	BORIC ACID ADDITION (GAL)	MAKEUP WTR ADDITION (GAL)
1475.0	-9.7	1465.3	.0	421.4

Sequoyah Nuclear Plant

Unit 1 & 2

General Operating Instructions

0-GO-4

POWER ASCENSION FROM LESS THAN 5% REACTOR POWER TO 30% REACTOR POWER

Revision 0056

Quality Related

Level of Use: Continuous Use

Effective Date: 06-04-2008

Responsible Organization: OPS, Operations

Prepared By: Judy R. Varner

Approved By: J. K. Wilkes

Current Revision Description

Updated turbine critical speeds (08000418). Revised Appendix F to allow Unit 2 Transformer Yard Distribution Cab. breakers to be "Locked Open" (080000207). Corrected numbering error in Appendix E as minor editorial change (080000230) Added steps in Section 5.3 to verify EHC pressure (08000031). Added reference to GOI-6 and added minor information regarding mils as minor editorial change (08000048)

THIS PROCEDURE HAS THE POTENTIAL TO IMPACT REACTIVITY.

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ATTACHMENTS

Attachment 1: UNIT START UP FROM LESS THAN 5% REACTOR POWER TO 30% REACTOR POWER

1.0 INTRODUCTION

1.1 Purpose

This General Operating (GO) Instruction provides necessary instructions to perform a unit startup from less than 5% Reactor Power with main feedwater reg bypass valves in **AUTO** to 30% Reactor Power with main feedwater reg valves in **AUTO**.

1.2 Scope

A. This GO contains the following sections:

5.1 Actions To Be Performed Prior To Increasing Reactor Power

5.2 Reactor Power Ascension to Between 13% and 15% RTP

5.3 Turbine Roll

5.4 Placing Main Generator In Service

5.5 Reactor Power Ascension to 30% RTP

2.0 REFERENCES

2.1 Performance References

A. 0-PI-NUC-092-002.0, *Incore Excore Detector Single Point Alignment*

B. 0-PI-NUC-092-081.0, *Prestartup NIS Calibration Following Core Load*

C. 0-PI-NUC-092-082.0, *Poststartup NIS Calibration Following Core Load*

D. 0-PI-OPS-047-760.1, *Main Turbine Actual Overspeed (Annual and 18 Month Tests)*

E. 0-PI-SXX-000-022.0, *Calorimetric Calculations*

F. 0-RT-NUC-000-001.0, *Restart Test Program*

G. 0-SO-35-1, *Generator Hydrogen Cooling System*

H. 0-SO-35-2, *Stator Cooling Water System*

I. 0-SO-35-4, *Monitoring Generator Parameters*

J. 0-SO-35-6, *Generator Core Condition Monitor*

K. 0-SO-35-7, *Hydrogen Dryer Operation*

L. 0-SO-27-1, *Condenser Circulating Water System*

M. 0-SI-NUC-092-079.0, *Power Range Monitor Channel Calibration By Incore-Excore Axial Imbalance Comparison*

N. 0-SI-OPS-092-078.0, *Power Range Nuclear Flux Channel Calibration by Heat Balance Comparison*

O. 1,2-PI-OPS-057-002.0, *Cycling of Unit PCBs Prior to Placing PCB in Service*

P. 1,2-SO-5-1, *Feedwater Heaters and Moisture Separator Reheaters*

Q. 1,2-SO-5-2, *No. 3 Heater Drain Tank and Pumps*

R. 1,2-SO-5-3, *No. 7 Heater Drain Tank and Pumps*

S. 0-SO-1-2, *Steam Dump System*

T. 0-SI-NUC-000-038.0, *Shutdown Margin*

U. 1-PI-OPS-000-020.1, *OATC MCR Duty Station Shift Relief and System Status Checklists Modes 1-4*

2.1 Performance References (continued)

V. 1-PI-OPS-057-001.0, *Functional Testing of Low Voltage Bus Cooling Pumps*

W. 2-PI-OPS-0-00-022.1, *OATC MCR Duty Station Shift Relief and System Status Checklists Modes 1-4*

X. 0-GO-5, *Normal Power Operation*

Y. 0-SO-24-1, *Raw Cooling Water System*

Z. 1,2-SO-47-2, *Electro-Hydraulic Control System*

AA. 0-SO-85-1, *Control Rod Drive System*

BB. SSP-6.24, *Maintenance Management System Configuration Control*

CC. Switchyard Letter 14, Visual Confirmation of Motor Operated Disconnects and Power Circuit Breaker Operation

DD. Switchyard Letter 32, Delle-Alsthom Airblast Circuit Breakers

EE. TI-28, *Curve Book*

FF. TI-40, *Determination of Reconditioned Reactor Power*

GG. 0-PI-OPS-000-666.0, *River Temperature Limits Specified by NPDES permit*

HH. SI-53, *Specific Iodine Isotopic Activity Concentration and/or DEI-131 Determination*

II. SI-407.2, *Radioactive Gaseous Waste Effluent Particulate and Iodine Dose Rates from Shield and Auxiliary Building Exhausts (Weekly/Special) and Condenser Vacuum Exhausts (Special)*

JJ. 0-SI-CEM-030-415.0, *Gaseous Effluent Requirements (Gross Alpha, Noble Gas and Tritium*

KK. 0-SO-57-1, *Main Bank Transformer Cooling*

LL. 0-SO-58-1, *Main Generator Bus Duct Cooling System*

2.2 Developmental References

A. FSAR Section 13.5

B. 0-GO-2-3, Plant Startup From Less Than 5% Reactor Power To 30% Reactor Power

C. W letter GP 89-155, RIMS S57 891026 972

D. W letter 86-02/B44 861112 002

E. W FAR 5-SQ-3771-075 Response

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

NOTE
Adherence to Precautions and Limitations is referenced in SPP-2.2.

A. Reactor Engineering should be contacted for guidance on core operating recommendations during unusual power maneuvers such as startup during end of core life. **[C.11]**

B. TRM 3.3.3.15 requires LEFM core thermal power (U2118) to be used to perform 0-SI-OPS-092-078.0 above 15% reactor power. LEFM indication is available if the following conditions are met:

- LEFM status NORMAL on ICS Calorimetric Data screen
- LEFM core thermal power (ICS point U2118) shows good (green) data.
- LEFM MFW header temp (ICS point T8502MA) greater than 250°F.

If LEFM indication is NOT available above 15% reactor power, then TR 3.3.3.15 action must be entered.

C. During startup, NIS power range indication may be reading significantly higher than true power until calibration adjustments are made. The following should be used to determine the most accurate indication for comparison with NIS:

- When reactor power is less than or equal to 15%, use average loop ΔT (UO485).
- When reactor power is greater than 15%, use LEFM core thermal power indication (U2118). If LEFM is **NOT** available, then continue using average loop ΔT up to 40%. (U1118 will be used above 40% with LEFM unavailable).

D. The boron concentration in the pressurizer should be maintained within 50 ppm of the RCS by use of pressurizer heaters and spray.

E. Pressurizer enclosure temperature should be maintained less than 150°F. Rapid changes in pressurizer enclosure temperature may result in pressurizer safety valve simmer.

3.1 Precautions (continued)

F. The low pressure turbine steam inlet temperature should be limited to 400°F when unit load is less than 10%. When reducing load, the reheater control valves should be adjusted to limit reheater outlet temperature to a maximum of 400°F within approximately 15 minutes after reaching 10% load.

G. Do **NOT** pass steam through the turbine with the rotor at rest. The turbine should be on turning gear anytime the main steam lines are pressurized up to turbine stop valves.

H. Change in load should be controlled in accordance with load changing curves of TI-28, Figures A.15 and A.16.

I. The turbine should be operated in 'IMP OUT" control during normal unit operation. "IMP IN" operation results in system swings and should only be used during the performance of valve tests. (W letter GP 89-155, RIMS S57 901-26 972)

J. The Predictive Maintenance Engineer (PDM) should be contacted following a unit trip so that he may determine if local vibration monitoring of the Turbine-Generator, by the PDM staff should be performed when the unit is restarted. Normally, monitoring is necessary following a refueling outage, a major maintenance outage on the turbine-generator, or after a plant trip which was due to a turbine initiated trip or a generator electrical initiated trip. Two hours lead time prior to the initial turbine roll is necessary to ensure that the PDM staff is onsite to monitor the start-up. The Maintenance Shift Supervisor (MSS) has the telephone numbers and pager numbers for the Predictive Maintenance Engineer and the Supervisor for the PDM staff.

3.1 Precautions (continued)

K. Any off frequency turbine operation is to be reported to the Component Engineering Group Vibration Engineer for record keeping. The report will include duration and magnitude of off-frequency operation.

L. Operation at off-frequencies is to be avoided in order to prevent the probable occurrence of turbine blade resonance. Prolonged periods of operation at certain off-design frequencies could cause excessive vibratory stresses which could eventually generate fatigue cracking in the blades. Off-frequency operation is permitted to the degree and time limit specified on the chart "Off-Frequency Turbine Operation", Figure A.26 of TI-28.

M. The valve position limiter should be periodically positioned approximately 10% above governor control indications (keeps governor valves off of the limiter) as turbine load is increased. This prevents inadvertent load increases by limiting governor valve opening and allows a faster response of the runback feature which ensures main feedwater system will supply the required amount of flow.

N. The position of control rod bank D should normally be ≥ 215 steps when power level is steady state at or above 85% RTP. At steady state power levels below 85%, control bank D should normally be ≥ 165 steps. If rod position is more than 2 steps below this guidance for long term, then an impact to safety analysis assumptions may occur. Long term will be defined/determined by Reactor Engineering and the Fuel Vendor.

O. At low power levels, the LP Heaters may be unbalanced in extraction steam supply use and heat pickup across the condensate side of the heater string. This condition should correct itself as the unit approaches 45-50% Turbine Power. (REF. PER 99-003789-000)

P. Operation of main generator without automatic voltage control could impact grid voltage requirements. The South East Area Load Dispatcher (SELD) should be notified immediately if generator is in service without automatic voltage regulator. Also, refer to Section E of GOI 6 for MVAR limits.

Q. Main Generator operation without Automatic Voltage control requires that Narrative Log entries be made (time, date, reason & duration) and that notification be made to Operations Duty Specialist (ODS) within twenty four (24) hours.

R. Main Generator operation outside of the Voltage Schedule in GOI-6 requires that Narrative Log entries be made (time, date, reason & duration) and that notification be made to South East Area Load Dispatcher (SELD) within one (1) hour.

3.1 Precautions (continued)

S. 0-PI-OPS-035-001.0 should be performed prior to turbine restart when recommended by engineering, following maintenance or plant activities in which the generator was depressurized during a forced outage, or after a refueling outage. 0-PI-OPS-035-001.0 provides verification and adjustment of the Seal Oil System normal and backup regulators. (REF PER-04-24237-000)

3.2 Limitations

A. After refueling operations, the NIS indications may be inaccurate until calibration at higher power levels. The NIS calibration procedures will adjust the PRM trip setpoints to ensure that the excore detectors do not contribute to an overpower condition. Prior to startup, the PRM high range flux trip setpoint will be adjusted from 109 to 60%, with the rod stop (C-2) remaining at 103%. **[C.2]**

B. Preconditioned Power Levels and Maximum Allowable Rates of Power Increase are specified in TI-40, *Determination of Preconditioned Reactor Power*.

C. During initial startups, based on Westinghouse recommendations, a lower power ramp rate limit has been implemented for power levels above the intermediate power threshold. The Intermediate Power Threshold is unit/cycle dependent and is determined by the Vendor. Refer to TI-40.

D. ICS will automatically monitor pre-conditioned power level as follows:

1. Point U1127 is reactor power in percent of RTP based on either secondary calorimetric or RCS ΔT depending on power level.

2. Point UO103 is a 20 minute rolling average of reactor power rate-of-change fitted over a 20 minute period. UO103 is a leading indicator of %/hour power ramp rate and can be used in deciding to speed up or slow down the ramp rate.

3. Point UO104 is a 1 hour rolling average of reactor power rate-of-change fitted over a 1 hour period. UO104 is used in demonstrating compliance with fuel pre-conditioning power ramp rate limits.

4. Point K0058 is the currently qualified (or pre-conditioned) power level.

5. These points can all be monitored with the ICS group display "TI40". Appendix A may be used if the ICS is unavailable.

E. Any TI-40 power increase limit that is exceeded in any one hour is evaluated in accordance with SPP-3.1.

3.2 Limitations (continued)

F. In the event of a change in the rated thermal power level exceeding 15% in one hour, notify Chemistry to initiate the conditional portions of SI-407.2 0-SI-CEM-000-050.0 and 0-SI-CEM-030-415.0 due to the thermal power change.

G. The main turbine shall be on turning gear at least one hour prior to rolling with steam.

H. Westinghouse should be contacted if the turbine is operated outside of its operating limits.

I. To prevent high vibratory stresses and fatigue damage to the last stage turbine blading, do **NOT** operate the turbine for even brief periods outside of limits listed below: [W Ltr GP 86-02 (B44 861112 002)]

1. At loads less than or equal to 30% (350 MW), the maximum permissible backpressure is 1.72 psia. (3.5" Hg). The ICS Computer alarm point UP5007 which will identify the condition of condenser pressure > 1.72 psia in conjunction with MW being < 350.

2. At loads greater than 30%, the maximum permissible backpressure is 2.7 psia (5.5" Hg) with a 5 minute limitation before tripping the turbine.

J. Generator voltage shall **NOT** exceed 24.8 kV.

K. The main generator field shall **NOT** be energized at less than 90% rated speed.

L. Do **NOT** allow the generator to become under-excited.

STARTUP ____ **Unit** 1 **Date** ____

4.0 PREREQUISITES

NOTE

Throughout this Instruction where an **IF/THEN** statement exists, the step should be **N/A'd** if the condition does **NOT** exist.

[1] **ENSURE** Instruction to be used is a copy of effective version. ____

[2] **ENSURE** Precautions & Limitation of Section 3.0 have been reviewed. ____

[3] **ENSURE** Reactor Power is between 1 and 4% with four main feedwater bypass reg valves in **AUTO**.
(**N/A** if manual bypass reg valve operation is allowed by Plant Manager) ☐

[4] **ENSURE** each performer documents their name and initials:

Print Name	Initials

STARTUP ____ Unit 1 Date ____

5.5 Reactor Power Ascension to 30% RTP

CAUTION

SG levels may swell or initiate oscillation when feedwater heaters are placed in service.

NOTES

1) The Steam Generator level operator is in control of unit startup until the main feedwater reg valves are in **AUTO**. **[C.5]**

2) After a main reg is adjusted DO **NOT** increase reactor power or open main reg further until plant stabilizes and S/G level returns to program. ALLOWING PLANT PARAMETERS TO STABILIZE BETWEEN REG VALVE ADJUSTMENTS IS THE KEY TO SMOOTH POWER ASCENSION.

[1] **ENSURE** main reg valves off seat in accordance with Appendix C, 3.0 (**N/A** if previously performed). ☑

NOTES

1) Without automatic voltage control, as generator loading is increased, generator VARs will trend in the negative (Incoming) direction. Voltage will have to be periodically adjusted using the Exciter Voltage Base Adjuster handswitch [HS-57-23] to maintain acceptable VARs. Refer to GOI-6 Section E for MVAR limits for generator stability.

2) Main Generator operation without Automatic Voltage control requires that Narrative Log entries be made (time, date, reason & duration) and that notification be made to Operations Duty Specialist (ODS) within twenty four (24) hours.

3) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that Narrative Log entries be made (time, date, reason & duration) and that notification be made to South East Area Load Dispatcher (SELD) within one (1) hour.

[2] **PERFORM** the following during load increase:

[2.1] **IF** Automatic Voltage Control is in service, **THEN ADJUST [HS-57-22]** Exciter Voltage AUTO Adjuster to control Generator MVARs. ____

[2.2] **IF** Automatic Voltage Control is NOT in service, **THEN ADJUST [HS-57-23]** Exciter Voltage Base Adjuster to control Generator MVARs. N/A

STARTUP ____ **Unit** 1 **Date** ____

5.5 Reactor Power Ascension to 30% RTP (continued)

NOTES

1) Power escalation rates should be performed within the limits of TI-40, unless SQN management stipulates lower allowable rates.

2) Confirmation from Chemistry Section **SHALL** be obtained prior to exceeding **30%** reactor power.

[3] **INITIATE** load increase in accordance **TI-40** to less than or equal 30% reactor power WHILE continuing this instruction. ☑

[4] **OPEN** main reg valves in small increments while maintaining reg bypass valves in **AUTO**. **[C.5]** ☑

[5] **IF** SG program level is **NOT** set at 44%,
THEN
ADJUST SG bypass reg controllers in accordance with Appendix C, Section 1.0. N/A

NOTE

TRM 3.3.3.15 requires using LEFM core thermal power to perform 0-SI-OPS-092-078.0 above 15% reactor power.

[6] **WHEN** reactor power is greater than 15%,
THEN
PERFORM the following:

[6.1] **DETERMINE** if LEFM is available:

- LEFM status NORMAL on ICS (NSSS and BOP) Calorimetric screen. ☑
- ICS point U2118 shows good (green) data. ☑
- Feedwater temperature (ICS point T8502MA) greater than 250°F. ☑

STARTUP ____ **Unit** 1 **Date** ____

5.5 Reactor Power Ascension to 30% RTP (continued)

[6.2] **IF** LEFM is available,
THEN
PERFORM the following:

A. **MONITOR** reactor power **USING** U2118. ☑

B. **PERFORM** 0-SI-OPS-092-078.0 **USING** U2118 to determine reactor power. ☑

[6.3] **IF** LEFM is NOT available,
THEN
PERFORM the following:

A. **ENTER** applicable action of TR 3.3.3.15. N/A ☐

B. **PERFORM** 0-SI-OPS-092-078.0 **USING** RCS ΔT to determine reactor power. ☐

C. **INITIATE** Work Order as necessary. ☐

D. **CONTINUE** power increase **USING** ΔT to determine reactor power. ☐

[7] **WHEN** turbine load is > 15%, **THEN**

VERIFY annunciator XA-55-4A, window E-3:

C-5 LOW TURB IMPULSE PRESS ROD WITHDRAWL BLOCKED

is **DARK**. ☑

[8] **WHEN** automatic rod control is desired,
THEN
PLACE rod control in **AUTO** in accordance with 0-SO-85-1. ____

STARTUP ____ **Unit** __1__ **Date** ____

5.5 Reactor Power Ascension to 30% RTP (continued)

CAUTION

DO NOT place a main reg valve in AUTO without sufficient flow being indicated on the controlling steam/feed flow indicators.

[9] **WHEN** it is desirable to place main feedwater reg valves in **AUTO,**
THEN
PERFORM Appendix C, Section 4.0. ____

[10] **ENSURE** the #3 HDT level controller **[LIC-6-105]** has been adjusted to maintain heater drain tank level within its normal operating range in accordance with 1,2-SO-5-2. ☑

[11] **ENSURE** the #7 HDT level controller(s) have been adjusted to maintain heater drain tank level within its normal operating range in accordance with 1,2-SO-5-3. ☑

[12] **WHEN** reactor power is greater than or equal to 20% on 2 out of 4 PRMs,
THEN
VERIFY the following Intermediate range rod stop bistables are **LIT**: **[C.1]**

[12.1] EI-92-5003, panel M-13 for IRM N-35, Hi Level Rod Stop **LIT**. ☑

[12.2] EI-92-5004, panel M-13 for IRM N-36, Hi Level Rod Stop **LIT**. ☑

[13] **WHEN** turbine load is greater than 20%, **THEN**

[13.1] **CLOSE** turbine drains using **[HS-7-1]**. ____

[13.2] **VERIFY** turbine startup drains are **CLOSED** by green light indication on Status Panel XX-7-1. ☑

[13.3] **ENSURE [HS-7-1]** is in **P-AUTO**. ☑

STARTUP ____ **Unit** ____ **Date** ____

5.5 Reactor Power Ascension to 30% RTP (continued)

[14] **WHEN** turbine load is between 20 and 24%, **THEN**

[14.1] **STOP** the load increase. ☑

[14.2] **STABILIZE** the plant. ☑

[15] **COMPARE** steam flow and feed flow indications for each loop, **AND**
SELECT the combination with the least deviation as the controlling channel. ____

CAUTION

The following step must be performed in small increments to allow the main reg valves time to adjust to changing pressures.

NOTE

When MFP Master Speed controller is reading 0% deviation, the ΔP is on program.

[16] **IF** MFPT Master Speed controller is in **MANUAL**, **THEN**

[16.1] **ADJUST** the MFP Master Speed Controller, **[PC-46-20]**, to obtain **ZERO** deviation on the controller. ☑

[16.2] **PLACE** the MFP Master Speed Controller, **[PC-46-20]** in **AUTO**. ____

[16.3] **MONITOR** MFP discharge to ensure that it remains stable and on program. ☑

[17] **ENSURE** the following:

[17.1] Main feedwater regs in **AUTO**. ☑

[17.2] Bypass reg valves **CLOSED** and controllers in **MANUAL**. ☑

[17.3] Running MFPT in **AUTO**. ☑

[17.4] MFPT recirc valve in **MANUAL**. ☑

STARTUP ____ Unit 1 Date ____

5.5 Reactor Power Ascension to 30% RTP (continued)

CAUTION

DO NOT fully close the MFPT recirculation valve if system parameters (i.e., S/G level, MFP discharge pressure, flow or feedwater reg valve controls) begin to swing.

[18] **ENSURE** operating MFP recirc valve is **CLOSED** in accordance with 1,2-SO-2/3-1. ☑

[19] **IF** MFP recirc valve will **NOT CLOSE, THEN**

CLOSE the associated recirc manual isolation valve (**N/A** valve **NOT** manipulated):

MFP	VALVE	VALVE POSITION	INITIALS
A	3-576	CLOSED	NM
B	3-577	CLOSED	NM

[20] **ENSURE** MFW reg valves are maintaining SG level and feedwater system parameters are stable. ☑

NOTES

1) Valve position limit and governor control meter are displayed on EHC Display panel 1,2-XX-047-2000 (M-2).

2) Power escalation rates should be performed within the limits of TI-40, unless SQN management stipulates lower allowable rates.

3) Confirmation from Chemistry Section **SHALL** be obtained prior to exceeding **30%** reactor power.

[21] **INITIATE** load increase in accordance **TI-40** to less than or equal to 30% reactor power WHILE continuing this instruction
AND
ADJUST turbine load as needed while maintaining valve position limit approximately 10% above governor control indication. ☐

STARTUP_____ **Unit** _____ **Date** _____

5.5 Reactor Power Ascension to 30% RTP (continued)

NOTE

HS-5-94 located in turbine building el 706, Col. T3G (Unit 1), Col. T14G (Unit 2).

[22] **PLACE [HS-5-94]** Low Point Drains in the CLOSED position. _____

[23] **VERIFY** intermediate range trip bistables:

[23.1] XX-55-5 trip status panel window 2 **LIT**. ☐

[23.2] XX-55-5 trip status panel window 22 **LIT**. ☐

[24] **VERIFY** power range trip bistables status as follows:

[24.1] XX-55-5 trip status panel window 6 **LIT**. ☐

[24.2] XX-55-5 trip status panel window 26 **LIT**. ☐

[24.3] XX-55-5 trip status panel window 46 **LIT**. ☐

[24.4] XX-55-5 trip status panel window 66 **LIT**. ☐

CAUTION

After refueling operations, the NIS indications may be inaccurate until calibration at higher power levels has been performed.

[25] **IF** startup is initial startup after a refueling,
THEN
VERIFY the following steps have been completed at approximately 30% Rx power: **[C.2]**

[25.1] **IF** required at this time,
THEN
ENSURE 0-SI-NUC-092-079.0 to check calibration of AFD indicators is complete.

_____ _____ _____
Rx Engineering Date Time

STARTUP_____ **Unit** _____ **Date** _____

5.5 Reactor Power Ascension to 30% RTP (continued)

[25.2] **ENSURE** 0-PI-NUC-092-002.0 "Incore/Excore Detector Single Point Alignment" has been performed or scheduled for 45% power plateau.

_____ _____ _____
Rx Engineering Date Time

[25.3] **ENSURE** PR high flux trip setpoint is scheduled to be increased from 60% to 109% prior to exceeding 50% power. **[C.2]**

_____ _____ _____
Rx Engineering Date Time

[25.4] **ENSURE** 0-SI-OPS-092-078.0 completed.

_____ _____ _____
Initials Time Date

[25.5] **ENSURE** 0-SI-NUC-000-126.0 "Hot Channel Factors" data has been collected or scheduled to be completed at 45%.

_____ _____ _____
Rx Engineering Date Time

[25.6] **ENSURE** applicable sections of 0-RT-NUC-000-001.0, *Restart Test Program* has been completed.

_____ _____ _____
Rx Engineering Date Time

NOTE

Unit 1 Secondary Boric Acid Injection is not required following S/G replacement.

[26] **IF** Secondary System Boric Acid Injection is in service,
THEN
ENSURE boric acid concentration is within acceptable range prior to placing MSR second stage reheat in service. _____

STARTUP_____ **Unit** _____ **Date** _____

5.5 Reactor Power Ascension to 30% RTP (continued)

NOTE

0-PI-OPS-047-760.1 Section 6.1 (Actual Overspeed Test) should be performed at least once every 12 months, but **NOT** to exceed 18 months. Section 6.1 may be performed prior to loading the turbine or after a soak period with the turbine loaded.

[27] **IF** 0-PI-OPS-047-760.1 Section 6.1 is to be performed following a soak period with the turbine loaded,
THEN
PERFORM the following:

[27.1] **OBTAIN** approval from Siemens/Westinghouse or Engineering that adequate soak has been completed. _____

[27.2] **GO TO** 0-GO-11, Turbine Shutdown Without Reactor Shutdown. _____

[28] **ENSURE** 1,2-LCV-6-105A and B are maintaining #3 heater drain tank level with in its normal operating range. ☐

NOTE

Benchboard instruments PI-5-87A for #7 heater and PI-5-84A for #6 heater may be used to determine heater shell side pressure.

[29] **IF** #7 heater drain tank (HDT) pressure is indicating an overpressurization condition,
THEN
GO TO 1,2-SO-5-3, Section 8.0, Infrequent Operation to prevent #7 HDT overpressurization. _____

[30] **IF** desired to place #3 and #7 heater drain tanks on recirc,
THEN
PERFORM applicable sections of 1,2-SO-5-2 and 1,2-SO-5-3. ☐

[31] **ENSURE** the remaining available pumps are aligned and ready for service in accordance with 1,2-SO-2/3-1:

[31.1] Condensate booster pumps. ☐

[31.2] Hotwell pump. ☐

STARTUP_____ **Unit** _____ **Date** _____

5.5 Reactor Power Ascension to 30% RTP (continued)

NOTE

When placing additional condensate pumps in service, or HDT pumps in service, ensure that the main reg valves respond correctly and then stabilize in the acceptable band.

[32] **IF** running condensate booster pump reaches approximately 140 amps, **THEN**

START the following pumps in accordance with 1,2-SO-2/3-1:

[32.1] Third HW pump (if available). _____

[32.2] Second CBP. _____

NOTE

0-SI-OPS-092-078.0 may be performed at the discretion of the Operator if one or more PRMs is indicating close to the ± 2% tolerance.

[33] **PERFORM** the following PRIOR TO exceeding 30% reactor power:

[33.1] **IF** LEFM indication is available, **THEN**

CALCULATE Calorimetric power:

Calorimetric power= U2118 _____ = _____% ☐
34.55

[33.2] **IF** LEFM indication is NOT available, **THEN**

CALCULATE reactor power:

Average value of RCS ΔT (UO485)=_____% _____

STARTUP_____ **Unit** _____ **Date** _____

5.5 Reactor Power Ascension to 30% RTP (continued)

[33.3] **VERIFY** all NIS Power Range channel drawers are within ± 2% of the calculated reactor power:

N-41	(X1-92-5005B)	YES ☐	NO ☐
N-42	(XI-92-5006B)	YES ☐	NO ☐
N-43	(XI-92-5007B)	YES ☐	NO ☐
N-44	(XI-92-5008B)	YES ☐	NO ☐

_____

[33.4] **IF** any of the above steps are checked NO, **THEN**

PERFORM 0-SI-OPS-092-078.0. _____

[34] **MAINTAIN** reactor power at less than or equal to 30% **UNTIL** SG, condensate, and feedwater chemistry is within limits for power ascension. ☐

CAUTION

Rolling the second MFP at this low power level with the #7 HDT pumps NOT pumping forward or bypassing to condenser may cause condensate perturbations and/or low pressure heater string isolations.

[35] **IF** desired to roll second MFPT for maintenance, testing, etc., **THEN**

[35.1] **ENSURE** #7 HDT is bypassing to condenser. ☐

[35.2] **PERFORM** in accordance with 1,2-SO-2/3-1. ☐

[36] **IF** 0-SI-OPS-092-078.0 has **NOT** been completed, **THEN**
ENSURE 0-SI-OPS-092-078.0 is completed. _____

[37] **ENSURE** steps 5.5[1] through 5.5[36] of this section complete. (applicable steps) _____

STARTUP_____ **Unit** _____ **Date** _____

5.5 Reactor Power Ascension to 30% RTP (continued)

[38] **REVIEW** plant parameters and indications,
AND
VERIFY stability prior to power ascension. _____

[39] **IF** desired to continue power ascension,
THEN
GO TO 0-GO-5, *Normal Power Operation.* _____

[40] **IF** desired to shutdown the unit,
THEN
GO TO 0-GO-6, *Power Reduction From 30% Reactor Power To Hot Standby.* _____

END OF TEXT

Facility:	Sequoyah	Scenario No.:	2	Op Test No.:	NRC
Examiners:		Operators:			

Initial Conditions: ~10^{-3} % power in Intermediate Range

Turnover: Raise Power to 1-2% Power

Target CTs: Isolate Steam flow and Feedwater flow to ruptured S/G prior to initiation of RCS Cooldown to target temperature.

Cooldown RCS to less than or equal to target temperature prior to RCS depressurization.

Event #	Malf. No.	Event Type*	Event Description
1		R-ATC N-SRO/BOP	Raise Power to 1-2%
2	NI04B	TS-SRO I-SRO/ATC	Intermediate Range Channel N-36 Fails low. ATC/SRO Identify and bypass failed channel per AOP. SRO Tech Spec Evaluation.
3	CV25A CV16	C-SRO/ATC	Letdown back pressure transmitter fails low. Increasing letdown line pressure due to backpressure control valve PCV-62-81 closing results in Letdown relief valve lifting. Manual control will not restore normal letdown flow with relief valve open. Letdown will be isolated and Excess letdown placed in service.
4	ED08C	TS-SRO C-SRO/BOP	Failure of 480 V Shutdown Board 1B1-B & related Safety Related Pumps are locked out. SRO Tech Spec Evaluation.
5	TH05A	M-All	S/G #1 Tube Rupture ~200 gpm requires Reactor Trip and Safety Injection.
6	RP16K608 A	C-SRO/ATC	Train "A" SSPS Slave Relay failure requires manual isolations and ESF equipment starts.
7	MSCOHS1 15A	C-SRO/BOP	Steam supply to Turbine Driven AFW pump from S/G #1 fails open and cannot be transferred to S/G #4. Requires isolation to reduce releases.
8	MS06A	C-SRO/BOP	S/G #1 Steam Line Brk Outside Containment. Requires crew implementation of actions in Faulted/Rupture S/G Procedure ECA-3.1.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 2 Summary

The Crew will assume shift with the unit in a startup and power in the intermediate range with instructions to continuing raising power to the Point of Adding Heat. ATC will manipulate control rods as directed by SRO, BOP will primarily control S/G levels as power is increased.

When the power increase is complete, Intermediate range channel N-36 will fail low. SRO will enter AOP-I.01 and direct RO actions to bypass the failed channel. If power increase is still in progress when the failure occurs, ATC will stabilize reactor power. SRO will evaluate Tech Specs and determine power cannot be increased above 5% until N-36 is operable.

After the NIS channel failure has been addressed, letdown backpressure transmitter PT-62-81 will fail low. Automatic control action will reduce letdown flow to attempt to increase pressure. Actual letdown line pressure will increase and result in letdown relief valve opening and failure to reseat. Normal letdown pressure and flow can not be manually established with relief valve open. ATC will respond in accordance with the annunciator response procedure and will be required to isolate letdown and establish Excess letdown using System Operating instructions.

When Excess letdown flow has been restored, 480 Vac Shutdown board 1B1-B will be lost due to a board fault and will not be restored during the scenario. SRO will implement AOP-P.05 and direct various ESF pumps to be locked out due to loss of power to the pump or supporting equipment. SRO will evaluate Tech Specs to identify, as a minimum, the Tech Spec directly related to the board and any other more limiting Tech Specs including 3.0.3 due to power loss to PORV block valve.

When 480 Vac board AOP actions and SRO Tech Spec evaluation is complete, Steam Generator #1 will develop a ~200 gpm tube rupture requiring Reactor Trip, Safety Injection, and implementation of emergency procedures. During performance of E-3, crew will isolate ruptured S/G to complete the first critical task and cooldown to target RCS Temperature to complete the second critical task.

When Safety Injection is actuated, a Slave Relay failure in the SSPS results in failure of several automatic actions to occur including Train "A" Control Room isolation and several ESF Pump Starts. Manual action is required by ATC to initiate isolation and start ESF Pumps.

During performance of E-3 actions, or possibly earlier as prudent action, operators will attempt to transfer steam supply for the Turbine Driven Auxiliary Feedwater pump from ruptured S/G #1 to S/G #4. The normal transfer will not work due to a failure of the #1 S/G steam supply valve. Isolation of an upstream steam supply will be required to reduce offsite releases from the ruptured S/G.

After the cooldown to target temperature in E-3 is complete, ruptured S/G #1 will develop a steam line break outside containment upstream of the MSIV resulting in depressurization of the Ruptured S/G and transition to Emergency Contingency Procedure ECA-3.1. In ECA-3.1 the Crew will evaluate current RCS cooldown and initiate continued cooldown to cold shutdown as required at this time consistent with specified T-cold cooldown limit of 100°F/hr.

The scenario may be terminated after RCS Cooldown evaluation is complete and cooldown is initiated if required.

Op Test No.: NRC	Scenario # 2	Event # 1	Page 1 of 41
Event Description: Raise Power			

Time	Position	Applicant's Actions or Behavior
Console Operator: **No action required for Event 1**		
Indications available: **None. Crew will perform startup IAW 0-GO-3, Section 5.2**		
NOTE Average loop ΔT (UO485) is considered to be the most accurate power indication below 15% power. NIS power range and steam dump demand should also be monitored. (**REFER TO** 0-SO-1-2 for steam dump demand program.)		
	RO	**WITHDRAW RODS OR DILUTE** to bring reactor power to between 1 and 2% RTP, while continuing with this instruction.
NOTE After refueling operations the "Initial Startup System Parameter Log" is performed during power escalations to provide the operator with alternate indications of power level (indications independent of calorimetric calculations). If significant differences occur (approx. 5%) between the alternate power indications then Engineering should be notified.		
	US	IF startup is after a refueling or maintenance on NIS, THEN INITIATE performance of 0-PI-OPS-000-001.0, *Initial Startup System Parameter Log.* ***This Step N/A***
	RO	COMPARE NIS power range instrumentation with loop ΔT indicators and steam dump demand to evaluate accuracy of PRMs.
	RO	SELECT the highest reading IRM or ΔI and PRM channels to be recorded on NR 45.
	Crew	REVIEW plant parameters and indications to determine plant stability prior to startup of Main Feed Pump.

Op Test No.: NRC Scenario # 2 Event # 1 Page 2 of 41

Event Description: Raise Power

Time	Position	Applicant's Actions or Behavior
	RO	MAINTAIN reactor power approximately 1%.
NOTE Steps 5.2[7] and 5.2[8] may be performed in any order. (The following 2 steps)		
	BOP	WHEN total Aux FW flow to SGs 1 and 2 is constant and greater than or equal to 300 gpm, THEN CLOSE [FCV-3-400], AFW PUMP A RECIRC ISOL VLV, and PLACE handswitch [HS-3-400A] in the PULL TO LOCK position.
	BOP	WHEN total Aux FW flow to SGs 3 and 4 is constant and greater than or equal to 300 gpm, THEN CLOSE [FCV-3-401], AFW PUMP B RECIRC ISOL VLV, and PLACE handswitch [HS-3-401A] in the PULL TO LOCK position.
NOTE Control rod bank D should be ≥165 steps at steady state power levels below 85% RTP. This guidance is to preclude long-term operation at <165 steps to avoid potential impact on safety analysis assumptions. Short-term operation at <165 steps is **NOT** a concern.		
	RO	ENSURE the plant is stabilized between 1 and 2% reactor power.
	RO	COMPARE NIS intermediate range instrumentation with loop ΔT indications to evaluate accuracy of IRMs.
	RO	RECORD IRM readings: N35 % RTP N36 % RTP
When power has been raised sufficiently to record a reactivity manipulation, and demonstrate AFW control, lead examiner may cue the next event.		

Op Test No.: NRC	Scenario # 2	Event # 2	Page 3 of 41
Event Description: NIS Intermediate Channel N-36 Fails Low			

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 2		
Indications available: **N-36 indicator on Panel M-4 Fails low.** **NR-45 Recorder channel (M-6) fails low (if selected).** **Note: No audible Alarms received.**		
	RO	Diagnose and announce failure.
	SRO	Enter and direct actions of AOP-I.01 Section 2.2

NOTES:		• For a high Intermediate Range (IR) channel failure, a reduction in reactor power to less than P-10 will result in a reactor trip. This condition will be corrected when the channel is bypassed in Step 5.
		• If an IR channel has failed at a level greater than P-6, the following conditions will exist:
		  • Source Range automatic re-enable at P-6 from IR signals will be disabled. (SRs will require manual reinstatement per 0-GO-6.)
		  • The following SR shutdown high flux annunciators will be disabled and DARK:
		  • SOURCE RANGE HIGH FLUX LEVEL AT SHUTDOWN [M-4B, B-1]
		  • SOURCE RANGE HIGH SHUTDOWN FLUX ALARM BLOCKED [M-4B, C-1]
		• Failure of an Intermediate Range Channel may affect the associated Source Range Channel.

	RO	**STABILIZE** reactor power at current level. ***(RO may adjust rods to stabilize power)***
	RO	**CHECK** at least one Intermediate Range OPERATING.

Op Test No.: NRC	Scenario # 2	Event # 2	Page 4 of 41
Event Description: NIS Intermediate Channel N-36 Fails Low			

Time	Position	Applicant's Actions or Behavior
	SRO	**EVALUATE** the following Tech Specs for applicability: • 3.3.1.1 (3.3.1), Reactor Trip System Instrumentation **Action 3b (From Table 3.3-1 Item 5) Applies** **Action 8a (From Table 3.3-1 Item 22.A) Applies but no actions required for SR Rx Trip.** • 3.3.3.5, Remote Shutdown Instrumentation **N/A (Since Source Range is turned off cannot definitely determine impact)** • 3.3.3.7, Accident Monitoring Instrumentation **Action 1a (From Table 3.3-10 Item 17b)** • 3.9.2, Refueling Operations Instrumentation **N/A**
	RO	**IF** reactor power less than 1%, **THEN ENSURE** OPERABLE IR channel selected on Nuclear Power Recorder [M-4, NR-45].
CAUTIONS:	• **Loss of instrument OR control power will cause a single channel reactor trip signal.** • **For loss of control power only, the reactor trip signal cannot be bypassed. Reducing reactor power below P-10 will result in a reactor trip.**	

Op Test No.: NRC	Scenario # 2	Event # 2	Page 5 of 41
Event Description: NIS Intermediate Channel N-36 Fails Low			

Time	Position	Applicant's Actions or Behavior
Evaluator Note: Some steps may be performed by RO or BOP depending on SRO direction for back panel operations.		
	RO/BOP	**CHECK** power available to failed Intermediate Range channel [M-13, N35/N36]: • INSTRUMENT POWER ON indicator LIT **AND** • CONTROL POWER ON indicator LIT
	RO/BOP	**PLACE** Level Trip switch for failed channel in BYPASS [M-13, N35/N36].
	RO/BOP	**VERIFY** NIS TRIP BYPASS annunciator LIT [M-6A, A-1].
	RO	**VERIFY** appropriate annunciator LIT: • INTERMEDIATE RANGE TRIP BYPASS CHANNEL I [M-4A, A-2] **OR** • INTERMEDIATE RANGE TRIP BYPASS CHANNEL II [M-4A, B-2]
	RO	**CHECK** associated Source Range Channel NOT affected.
	SRO	**GO TO** appropriate plant procedure.

Op Test No.:	NRC	Scenario #	2	Event #	2	Page	6	of 41

Event Description: NIS Intermediate Channel N-36 Fails Low

Time	Position	Applicant's Actions or Behavior
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
Lead Examiner may cue next event when AOP I.01 and Tech Spec Evaluation are complete.		

Op Test No.: NRC	Scenario # 2	Event # 3	Page 7 of 41
Event Description:	Letdown Press Transmitter PT-62-81 Fails low & Letdown relief valve sticks open		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 3		
Indications available: **Alarm XA-55 6C, C-4: "TS-62-75 Low Pressure Letdown Relief Temp High"** **Letdown Flow drops to zero (Cannot be increased to normal).** **PRT pressure increasing.** **L/D Relief Line To PRT Temp Indicator 1-TI-62-75 remains elevated.** **Alarm XA-55-5A, D-1 "PS-68-301 PRESSURIZER RELIEF TANK PRESS HIGH" (Delayed)** **Alarm XA-55-27B-B, A-5 "LETDOWN HX OUTLET FLOW/TEMP ABNORMAL"**		
	RO	Refer to Annunciator Response Procedure.
	RO	**MONITOR** letdown pressure on **[1-PI-62-81]**. ***(Indicates zero Pressure)***
	RO	**IF [1-PCV-62-81]** is Closed, **THEN** **TAKE** manual control of **[1-PCV-62-81]** and **RESTORE** normal letdown flow. ***(Should attempt to restore ~75 gpm letdown flow)***
	RO	**MONITOR** low press letdown relief tailpipe temp on **[1-TI-62-75]**. *(Should indicate elevated temperature)*
	RO	**MONITOR** VCT and PRT levels. *(Parameters will be changing due to relief valve leak)*
NOTE		If PRT level increasing, [1-62-662] may be lifting or leaking through.
	RO	**IF** US concurs, **THEN** **ATTEMPT** to reduce letdown pressure to allow closing of **[1-62-662]**.
	RO	**IF [1-62-662]** fails to seat, **THEN** **EVALUATE** removing normal letdown from service **USING** 1-SO-62-1 **AND** placing Excess Letdown in service **USING** 1-SO-62-6 to allow 62-662 to cool. *(Letdown should be removed from service and Excess letdown placed in service SO Steps begin on next page.)*

Op Test No.: NRC	Scenario # 2	Event # 3	Page 8 of 41
Event Description:	Letdown Press Transmitter PT-62-81 Fails low & Letdown relief valve sticks open		

Time	Position	Applicant's Actions or Behavior
	RO	**IF** leakage NOT stopped, **THEN** **GO TO** AOP-R.05, RCS Leak. *(Leakage is stopped when letdown is isolated)*
Evaluator Note:		The following steps are from 1-SO-62-1 "Chemical And Volume Control System" Section 7.1 "Removing Letdown From Service".
	RO	**OBTAIN** permission from Unit 1 SRO to remove letdown from service.
	RO	**IF** excess letdown is to be put in service prior to isolation of normal letdown, **THEN** **PERFORM** 1-SO-62-6, **AND** **RETURN** to step **[3]**. *(Letdown should be isolated first due to leaking relief valve)*
	RO	**ENSURE** following letdown orifice valves **CLOSED**: A. **[1-FCV-62-72]** B. **[1-FCV-62-73]** C. **[1-FCV-62-74]**
	RO	**CLOSE** following letdown isolation valves: **VALVE** / **INITIALS** 1-FCV-62-69 _____ 1-FCV-62-70 _____
	RO	**IF** RCS temperature is greater than 350°F **AND** normal letdown will NOT be immediately restored, **THEN** **PERFORM** Section 7.2 to isolate normal charging.

Op Test No.: NRC	Scenario # 2	Event # 3	Page 9 of 41
Event Description:	Letdown Press Transmitter PT-62-81 Fails low & Letdown relief valve sticks open		

Time	Position	Applicant's Actions or Behavior
Evaluator Note:		The following steps are from 1-SO-62-1 "Chemical And Volume Control System" Section 7.2 "Removing Charging From Service".
NOTE		RCP seal injection flow must be maintained at all times when loops are being filled and any time thereafter except in "special cases" deemed necessary by SM when RCS is in a partial drain down status.
	RO	**OBTAIN** permission from Unit 1 SRO to remove charging from service.
	RO	**VERIFY** letdown is out of service.
	RO	**ENSURE [1-HIC-62-93A]** in **MANUAL**.
	RO	**IF** removing Charging from service during refueling outage, **THEN** **PERFORM** timed stroke on valves **[1-62-537]** and **[1-62-539]** using 1-PI-OPS-000-003.0 (N/A if not required). *(Step should be N/A)*
NOTE		Technical Specification Figure 3.5.6-1, Seal Injection Flow Limits, depicts acceptable seal injection flow for Modes 1-3.
	RO	**IF** RCP seal injection is in service, **THEN** **ADJUST [1-HIC-62-93A]** and **[1-HIC-62-89A]** until **[1-FCV-62-89]** is **CLOSED**, while maintaining seal injection flow between 6 and 11 gpm per RCP.
	RO	**IF** normal charging is in service, **THEN** **CLOSE [1-FCV-62-86]** Normal Charging Isolation.
	RO	**IF** alternate charging is in service, **THEN** **CLOSE [1-FCV-62-85]**, Alternate Charging Isolation.
	RO	**ENSURE** seal injection at 6-11 gpm. (N/A if seal injection NOT in service)

Op Test No.: NRC	Scenario # 2	Event # 3	Page 10 of 41
Event Description:	Letdown Press Transmitter PT-62-81 Fails low & Letdown relief valve sticks open		

Time	Position	Applicant's Actions or Behavior
	RO	**CLOSE** following charging hdr isolation valves: VALVE / INITIALS 1-FCV-62-90 _____ 1-FCV-62-91 _____
NOTE 1		When RCS temperature is < 350°F, one centrifugal charging pump shall be incapable of injecting as specified in 1-SI-OPS-068-001.0, Low Temperature Overpressure Protection.
NOTE 2		When RCS temperature is < 350°F, one OPERABLE ECCS subsystem is acceptable without single failure consideration on the basis of the stable reactivity condition of the Reactor and the limited core cooling requirements.
	RO	**IF** CCP is to be stopped, **THEN** ..... *(Step Should be N/A)*
Evaluator Note:		The following steps are from 1-SO-62-6 "Excess Letdown" Section 5.0 "Startup/Standby Readiness".
NOTE 1		When excess letdown is placed in service the containment radiation monitors may show some changes in particulate reading.
NOTE 2		Coordinate the following steps with AUO stationed at 0-L-2 to monitor RCDT for pump operation as required during the 50 gallon flush.
	RO	**ENSURE [1-FCV-62-93]** is in **MANUAL** and **[a] OPERATE [1-FCV-62-93] USING [1-HIC-62-93A]** as required to regulate charging flow to keep pressurizer level on program. **[b] OPERATE [1-FCV-62-89] USING [1-HIC-62-89A]** as required to maintain RCP seal flows in limits

Op Test No.: NRC Scenario # 2 Event # 3 Page 11 of 41

Event Description: Letdown Press Transmitter PT-62-81 Fails low & Letdown relief valve sticks open

Time	Position	Applicant's Actions or Behavior
	RO	**NOTIFY** RADCON that Excess Letdown is being placed in service.
	RO	**ENSURE [1-FCV-70-143]** CCS water to the excess letdown heat exchanger is **OPEN**.
	RO	**ENSURE [1-FCV-70-85]** Excess Letdown Heat Exchanger CCS flow control valve is **OPEN**.
NOTE		Step **[5]** will prevent subjecting the CVCS piping downstream of the Excess Letdown HX to a temperature above the design value.
	RO	**ENSURE [1-FI-70-84]** is indicating greater than 230 gpm.
	RO	**PLACE [1-FCV-62-59]** Excess Letdown 3-way Divert Valve in **DIVERT**.
CAUTION		**FCV 62-63 has replaced RCP seal leak-off isolation valves as the primary means for isolating seal flow. The normal letdown path for excess letdown will not be available if FCV-62-63 is CLOSED.**
NOTE		Back flow through the RCP seals will occur should the RCP seal leakoff isolation valves fail to their OPEN position on loss of air or electrical power.
	RO	**IF** less than 100 psig in RCS and **[1-FCV-62-63]** is **CLOSED** and excess letdown will be aligned for NORMAL operation, **THEN** ..... *(Step Should be N/A)*
	RO	**OPEN [1-FCV-62-54]** Cold Leg Loop #3 Excess Letdown isolation valve.
	RO	**OPEN [1-FCV-62-55]** Excess Letdown containment isolation valve.
NOTE		ICS point 1L2400A or the AUO stationed at 0-L-2 can be used to monitor RCDT for level increase during the 50 gallon flush. Reference the RCDT Level vs Volume table in TI-28.

Op Test No.: NRC Scenario # 2 Event # 3 Page 12 of 41

Event Description: Letdown Press Transmitter PT-62-81 Fails low & Letdown relief valve sticks open

Time	Position	Applicant's Actions or Behavior
	RO	**OPEN [1-FCV-62-56]** slowly to flush piping to RCDT.
	RO	**WHEN** approximately 50 gallons have flushed, **THEN** **CLOSE [1-FCV-62-56]**, Excess Letdown Flow Control Valve.
	RO	**PLACE [1-FCV-62-59]** Excess Letdown 3-way Divert Valve in **NORMAL**.
NOTE 1		Normally the temperature read on 1-TI-62-58 should be less than 200°F. If operation requires temperatures greater than 200°F, the pressure at 1-PI-62-64 (local indicator El. 690 Pnl L-46) should be less than 100 psig to protect the Grinnell valves.
NOTE 2		Operation above 200°F will require that Systems Engineering be notified to allow an evaluation of the need for valve maintenance.
	RO	**[13] OPEN [1-FCV-62-56]** slowly to increase excess letdown flow to desired amount, not to exceed 240°F heat exchanger outlet temperature, as indicated on 1-TI-62-58.
NOTE		Placing Excess Letdown in service causes increased activity in various areas of the Auxiliary Building.
	RO	**NOTIFY** RADCON that Excess Letdown has been placed in service.
Evaluator Note:		The following Crew Brief and Notification actions are not contained in the procedure.
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
Lead Examiner may cue the next event when Excess letdown flow has been established.		

Op Test No.: NRC Scenario # 2 Event # 4 Page 13 of 41

Event Description: 480 volt Shutdown board 1B1-B Failure

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 4		
Indications available: **Alarm XA-55 1B Window D-6: "480V SD BD 1B1-B Failure/Undervoltage** **Panel M-1 Indicator 1-EI-57-83A indicates Zero Volts.** **Green Lights on both 480V SD BD 1B1-B supply Bkr mimic lights on (M-1)** **Various other alrms.**		
	RO	Refer to ARP for XA-55-1B window D-6
	RO	**IF** loss of offsite power, **THEN** **GO TO** AOP-P.01, *Loss of Offsite Power.*
	RO	**CHECK [1-EI-57-83A]** for Voltage on 1B1-B Shutdown Bd.
	RO	**IF** 1B1-B Shutdown board is deenergized, **THEN** **GO TO** AOP-P.05, Loss of Unit 1 Electrical Shutdown Boards.
	SRO	Enter and direct actions of AOP-P.05 section 2.5
CAUTIONS:	• **Operation of RCPs for greater than 2 minutes without CCS cooling to oil coolers will result in bearing temperatures greater than 200°F.** • **Containment Spray Pumps may experience bearing failure 10 minutes after loss of CCS cooling.**	
NOTE:	• CCPs, SI pumps, and RHR Pumps must be considered INOPERABLE when the associated train of CCS is out of service; however, pumps are available for operation if needed in an emergency.	
	BOP	**ENSURE** 1A-A CCS Pump SUPPLYING Train A CCS.
	RO	**MONITOR** REACTOR COOLANT PUMPS MOTOR THRUST BEARING TEMP HIGH alarm DARK [1-M-5B, E-3].
NOTE 1	Power is lost to 1-FCV-72-13, Train B Containment Spray Pump Recirc Valve, and 1-FCV-72-2, Containment Spray Pump Header Isolation.	
NOTE 2	Power is lost to 1-FCV-74-24, Train B RHR Minimum Flow Valve.	

Op Test No.: NRC Scenario # 2 Event # 4 Page 14 of 41

Event Description: 480 volt Shutdown board 1B1-B Failure

Time	Position	Applicant's Actions or Behavior
	RO	**PLACE** the following pumps in **PULL TO LOCK**: • 1B-B RHR Pump • 1B-B Containment Spray Pump
	SRO	**PERFORM** Appendix AA, Potential Tech Spec Impacts. **Evaluator Note:** SRO should identify Tech for the inoperable board and other more limiting Tech Specs from the list in Appendix AA. **LCO 3.8.2.1, Action a (8 hr action for 480V BD 1B1-B Inop)** **LCO 3.4.3.2 Action d (1 hr action to close and remove power from PORV with De-Energized Block Valve. Action d also requires implementation of Action b which potentially leads to 3.0.3 since the block valve cannot be closed to comply with Action b.)** **Other Tech Specs less limiting than the PORV Spec may also be identified as follows:** **LCO 3.5.2 Action (72 hr) - ECCS** **LCO 3.6.2.1 a & b Action (72 hr) – Containment Spray.**
	BOP	**DISPATCH** operators with radios to Shutdown Board Room [AB el. 734] to determine cause of failure.
	BOP	**CHECK** Air System pressures greater than 90 psig [M-15]: • 0-PI-32-104A, Aux Control Air Hdr A • 0-PI-32-105A, Aux Control Air Hdr B • 0-PI-32-200, Control Air Hdr • 0-PI-33-199, Service Air Hdr

Op Test No.: NRC	Scenario # 2	Event # 4	Page 15 of 41
Event Description: 480 volt Shutdown board 1B1-B Failure			

Time	Position	Applicant's Actions or Behavior
NOTE:	Loss of this board will result in loss of Train B Supply to Spare Charger 1-S.	
	BOP	**ENSURE** Vital Battery Charger II IN SERVICE **USING** 0-SO-250-1. ***(Note: Vital Charger II is normally in service therefore crew may not dispatch personnel)***
CAUTION:	**Loss of CRDM cooling fans can affect operability of rod position indicators due to temperature fluctuations.**	
	BOP	**EVALUATE** starting additional CRDM cooling fans based on reactor cavity air temperature (T1014A) and RPI indications **USING** 0-SO-30-6.
	BOP	**ENSURE** following equipment STOPPED and LOCKED OUT : • 1B-B CCS Pump • 1B-B Thermal Barrier Booster Pump
	BOP	**ENSURE** C-S or 2B-B CCS Pump supplying Train B CCS.
	BOP	**CHECK** CCS SFP Cooling ADEQUATE: • ALIGNED to Unit 2 **OR** • 1A-A CCS Pmp in service to Train A CCS *(Note aligned to Unit 1 ok at this time)*
When Tech Spec Evaluation complete, Lead Examiner may cue the next event.		

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 16 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 5 **Insert S/G #1 SGTR at 4.2 severity (~200 gpm).**		
Indications Available: **Loop 1 Steam Generator tube Rupture:** • **0-AR-M12-A, C1, CNDS VAC PMP LO RNG AIR EXH MON HIGH RAD** • **Pressurizer pressure decreasing** • **Pressurizer level decreasing and charging flow increasing** • **Loop 1 Main Steam Line Rad Monitor Increasing** **Train A SSPS Slave Relay Failure:** • **Train A CRI annunciator not lit with SI** • **1A-A RHR Pump not running with SI** • **1A-A SI Pump not running with SI** **TDAFW Pump Steam supply form Loop 1 Fails open;** • **Red light on and Valve will not close for man transfer to loop 4.**		
Evaluator Note:	Crew may temporarily enter AOP-R.01 for S/G Tube leak prior to Rx Trip and Safety Injection	
Evaluator Note:	The followings steps are from AOP-R.01 Section 2.1, E-0 Steps immediately follow (Page 18)	
NOTE:	This section should be used if tube leakage has an observable effect upon charging flow and/or Pressurizer level OR if directed by Section 2.2 due to leak rate exceeding 75 gallons per day (not due to temporary spike).	
	RO	**CONTROL** charging flow **USING** FCV-62-89 and FCV-62-93 as necessary to maintain pzr level on program.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 17 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	SRO/RO	**MONITOR** Pressurizer level STABLE or RISING. *(RNO)* **PERFORM** the following: a. **START** additional CCP as necessary. b. **IF** pressurizer level continues to drop, **THEN** **ENSURE** letdown isolated: • FCV-62-72 CLOSED • FCV-62-73 CLOSED • FCV-62-74 CLOSED *(Normal Letdown Previously Isolated Crew may elect isolate Excess letdown as time allows)* c. **IF** loss of Pressurizer level is imminent, **THEN** **PERFORM** the following: 1) **TRIP** the reactor. 2) **INITIATE** Safety Injection. 3) **GO TO** E-0, Reactor Trip or Safety Injection. *(SRO Should eventually Direct Tripping the Reactor, initiating SI and Enter E-0)*
	RO	**MAINTAIN** VCT level greater than 13% using automatic or manual makeup.
	SRO	**INITIATE** rapid shutdown by performing the following: *(Shutdown should not be initiated due to size of the leak)*

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 18 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
Evaluator Note: The following steps are from E-0		
	SRO	Enter and Direct performance of E-0, Reactor Trip Or Safety Injection.
NOTE 1: Steps 1 through 4 are immediate action steps. **NOTE 2:** This procedure has a foldout page.		
Evaluator Note:		Slave Relay failure should be identified and manual actions taken during performance of prudent operator actions immediately following performance of Immediate Operator Actions. • **Manually Start 1A-A RHR Pump (M-6)** • **Manually start 1A-A SI Pump (M-6)** • **Manually Actuate A Train Control Room Isolation (M-6)**
Evaluator Note:		Crew may also attempt to transfer the TDAFW steam supply from the ruptured S/G early as prudent action. If steam supply transfer is attempted the failed open steam supply valve from S/G #1 should be identified and steam supply to the TDAFW pump isolated. If not isolated early the failure will be addressed later in E-3.
	RO	VERIFY reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps. • Neutron flux DROPPING
	BOP	VERIFY turbine TRIPPED: • Turbine stop valves CLOSED.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 19 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** at least one train of shutdown boards ENERGIZED.
	RO	**DETERMINE** if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D].
Evaluator Note:	If not previously Identified, Slave relay failures should be identified during performance ES-0.5. When Identified, equipment should be manually actuated promptly.	
	BOP	**PERFORM** ES-0.5, Equipment Verifications WHILE continuing in this procedure. (ES-0.5 At end of Scenario)
	BOP	**DETERMINE** if secondary heat sink available: a. **CHECK** total AFW flow greater than 440 gpm. b. **CHECK** narrow range level greater than 10% [25% ADV] in at least one S/G. c. **CONTROL** feed flow to maintain narrow range level between 10% [25% ADV] and 50% in intact or ruptured S/Gs.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 20 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	BOP/RO	**CHECK** if main steam lines should be isolated: a. **CHECK** if any of the following conditions have occurred: • Any S/G pressure less than 600 psig. **OR** • Any S/G pressure dropping UNCONTROLLED. **OR** • Phase B actuation.
	RO	**CHECK** RCP trip criteria: a. **CHECK** the following: • RCS pressure less than 1250 psig **AND** • At least one CCP **OR** SI pump RUNNING.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 21 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	RO/BOP	**MONITOR** RCS temperatures: • **IF** any RCP running, **THEN** **CHECK** T-avg stable at or trending to between 547°F and 552°F. *(If No Perform Following RNO)* **IF** temperature less than 547°F and dropping, **THEN** **PERFORM** the following: a. **ENSURE** steam dumps and atmospheric reliefs CLOSED. b. **IF** cooldown continues, **THEN** **CONTROL** total feed flow: 1) **ENSURE** total AFW flow less than or equal to 600 gpm. 2) **MAINTAIN** total AFW flow greater than 440 gpm UNTIL narrow range level is greater than 10% [25% ADV] in at least one S/G. *(AFW Flow to Ruptured S/G #1 may be isolated during control step. Level should be >10%)*

Op Test No.: NRC Scenario # 2 Event # 5,6, & 7 Page 22 of 41

Event Description: #1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK** pressurizer PORVs, safeties, and spray valves: a. Pressurizer PORVs CLOSED. b. Pressurizer safety valves CLOSED. c. Normal spray valves CLOSED. d. Power to at least one block valve AVAILABLE. e. At least one block valve OPEN.
	BOP	**DETERMINE** if S/G secondary pressure boundaries are INTACT: • **CHECK** all S/G pressures CONTROLLED or RISING. • **CHECK** all S/G pressures greater than 140 psig.
	BOP	**DETERMINE** if S/G tubes are INTACT: a. **CHECK** the following: • all S/G narrow range levels CONTROLLED or DROPPING • secondary radiation NORMAL **USING** Appendix A, Secondary Rad Monitors. (App. A is also contained in ES-0.5). ***(Crew will Transition to E-3 at this Step)***
	SRO	Enter and direct performance of E-3 Steam Generator Tube rupture.
	RO	**MONITOR** at least one RCP RUNNING.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 23 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	RO	**MONITOR** RCP trip criteria: a. **CHECK** the following: • RCS pressure less than 1250 psig **AND** • At least one CCP **OR** SI pump RUNNING.
	BOP	**MONITOR** indications of Ruptured S/G(s): a. **IDENTIFY** Ruptured S/G(s) as indicated by any of the following: • Unexpected rise in any S/G narrow range level. **OR** • High radiation from any S/G sample. **OR** • RADCON survey of main steam lines and S/G blowdown lines. **OR** • High radiation on any main steamline radiation monitor.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 24 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
CAUTION		**Isolating both steam supplies to the TD AFW pump when it is the only source of feed flow will result in loss of secondary heat sink.**
	BOP	**ISOLATE** flow from Ruptured S/G(s): a. **ADJUST** Ruptured S/G(s) atmospheric relief controller setpoint to 87% in AUTO. (1040 psig) b. **CHECK** Ruptured S/G(s) atmospheric relief hand switch in P-AUTO and valve(s) CLOSED. c. **CLOSE** TD AFW pump steam supply from Ruptured S/G FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4). ***(FCV-1-15 will not close RNO Required)*** **IF** at least one MD AFW pump running, **THEN** **ISOLATE** steam to TD AFW pump **USING** FCV-1-17 or FCV-1-18. d. **VERIFY** Ruptured S/G(s) blowdown isolation valves CLOSED.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 25 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
Critical Task 1 – Part 1	BOP	***Critical Task:*** *Prior to Initiation of RCS Cooldown to Target Temperature.* e. **CLOSE** Ruptured S/G(s) MSIV and MSIV bypass valve. **Evaluator Note:** Isolating TDAFW pump from Ruptured S/G should also be considered part of this critical task.
CAUTION	**Feeding a S/G that is Faulted and Ruptured increases the potential for an uncontrolled RCS cooldown and S/G overfill. This option should NOT be considered UNLESS needed for RCS cooldown.**	
Critical Task 1 – Part 2	BOP	**MONITOR** Ruptured S/G(s) level: a. **CHECK** narrow range level greater than 10% [25% ADV]. b. **WHEN** ruptured S/G level is greater than 10% [25% ADV], **THEN** **PERFORM** the following: 1) **STOP** feed flow to ruptured S/G. 2) **ENSURE** Turbine Driven AFW LCV for ruptured S/G in CLOSE PULL TO LOCK. *(Crew will isolate or verify isolated AFW to Loop 1 S/G)* ***Critical Task:*** *Prior to Initiation of RCS Cooldown to Target Temperature.*

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 26 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** Ruptured S/G ISOLATED from Intact S/G(s): a. **CHECK** either of the following conditions SATISFIED: • Ruptured S/G MSIVs and MSIV bypass valves CLOSED **OR** • MSIV(s) and MSIV bypass valve(s) CLOSED on Intact S/G(s) to be used for RCS cooldown. b. **CHECK** S/G #1 or S/G #4 ruptured.
Critical Task 1 – Part 1 (Cont'd)	BOP	c. **CHECK** TDAFW pump steam supply from ruptured S/G ISOLATED: • FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4) CLOSED *(FCV-1-15 will not close, if not previously performed RNO will be required)* **DO NOT CONTINUE** this procedure UNTIL ruptured S/G steam supply isolated by one of the following: • FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4) CLOSED **OR** • FCV-1-17 or FCV-1-18 CLOSED **OR** • TDAFW pump TRIPPED.
	BOP	**CHECK** Ruptured S/G pressure greater than 550 psig (Unit 1) or 425 psig (Unit 2).
	SRO	Determine Target Temperature using table on next page.

Op Test No.:	NRC	Scenario #	2	Event #	5,6, & 7	Page	27	of	41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open								

Time	Position	Applicant's Actions or Behavior

NOTE

- Blocking low steamline pressure SI as soon as pressurizer pressure is less than 1960 psig will prevent an inadvertent MSIV closure and keep the condenser available for steam dump.
- After the low steamline pressure SI signal is blocked, main steamline isolation will occur if the high steam pressure rate setpoint is exceeded.
- The 1250 psig RCP trip criterion is NOT applicable after RCS cooldown is initiated in the following step.

INITIATE RCS cooldown:

a. **DETERMINE** target core exit T/C temperature based on Ruptured S/G pressure:

Lowest Ruptured S/G pressure (psig)	Target Core Exit T/C Temp (°F)
1100 or greater	497
1050 - 1099	492
1000 - 1049	486
950 - 999	480
900 - 949	473
850 - 899	467
800 - 849	460
750 - 799	453
700 - 749	445
650 - 699	437
600 - 649	428
550 - 599	419
500 - 549	410
450 - 499	399
425 - 449	393

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 28 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	BOP	b. **WHEN** RCS pressure less than 1960 psig, **THEN** **PERFORM** the following: 1) **BLOCK** low steamline pressure SI. 2) **CHECK** STEAMLINE PRESS ISOL/SI BLOCK RATE ISOL ENABLE permissive LIT. [M-4A, A4]
	BOP	c. **DUMP** steam to condenser from Intact S/G(s) at maximum achievable rate: 1) **CHECK** condenser available: • C-9 condenser interlock permissive LIT. [M-4A, E6] • Intact S/G MSIVs OPEN. 2) **PLACE** steam dumps in OFF. 3) **ENSURE** steam dumps in steam pressure mode with demand less than 25%. 4) **PLACE** steam dumps in ON. 5) **ADJUST** steam dump demand to FULLY OPEN three cooldown valves. 6) **WHEN** T-avg is less than 540°F, **THEN** **BYPASS** steam dump interlock. 7) **RAISE** AFW flow to intact S/Gs as necessary to support cooldown.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 29 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	BOP	d. **WHEN** core exit T/Cs less than target temperature determined in Substep 8.a, **THEN** **PERFORM** the following: 1) **CLOSE** steam dumps or S/G atmospheric reliefs to stop cooldown. 2) **REDUCE** AFW flow as necessary to stop cooldown. **MAINTAIN** total feed flow greater than 440 gpm UNTIL level greater than 10% [25% ADV] in at least one Intact S/G. 3) **MAINTAIN** core exit T/Cs less than target temperature **USING** steam dumps or atmospheric reliefs.
	BOP	**MAINTAIN** Intact S/G narrow range levels: a. Greater than 10% [25% ADV] b. Between 20% [25% ADV] and 50%.
CAUTION	**Any time a pressurizer PORV opens, there is a possibility that it may stick open.**	
	RO	**MONITOR** pressurizer PORVs and block valves: a. Power to block valves AVAILABLE b. Pressurizer PORVs CLOSED c. At least one block valve OPEN.
	RO	**RESET** SI signal.

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Event Description: #1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** AC busses energized from start busses.
	RO	**ENSURE** Phase A and Phase B RESET.
	RO	**CHECK** control air established to containment: [Panel 6K and 6L] • 1-FCV-32-80 (2-FCV-32-81) Train A essential air OPEN • 1-FCV-32-102 (2-FCV-32-103) Train B essential air OPEN • 1-FCV-32-110 (2-FCV-32-111) non-essential air OPEN.
	RO	**DETERMINE** if RHR pumps should be stopped: a. **CHECK** RHR pump suction aligned from RWST. b. **CHECK** RCS pressure greater than 300 psig. c. **STOP** RHR pumps and **PLACE** in A-AUTO. d. **MONITOR** RCS pressure greater than 300 psig.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 31 of 41
Event Description: #1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open			

Time	Position	Applicant's Actions or Behavior
Critical Task 2	BOP	**CHECK** if RCS cooldown should be stopped: a. **CHECK** core exit T/Cs less than target temperature determined in Substep 8.a. **DO NOT CONTINUE** this procedure UNTIL core exit T/Cs less than target temperature. b. **CLOSE** steam dumps or atmospheric reliefs to stop cooldown. c. **REDUCE** AFW flow as necessary to stop cooldown. **MAINTAIN** total feed flow greater than 440 gpm UNTIL level greater than 10% [25% ADV] in at least one Intact S/G. d. **MAINTAIN** core exit T/Cs less than target temperature **USING** steam dumps or atmospheric reliefs. *(**Critical Task**: Prior to RCS Depressurization)*

IMPORTANT

Evaluator Note: When cooldown complete, initiate Event 8 (S/G #1 Steamline break outside containment to ensure prompt transition to ECA-3.1 in the next step.

Op Test No.: NRC	Scenario # 2	Event # 5,6, & 7	Page 32 of 41
Event Description:	#1 S/G Tube Rupt, ESF Slave Relay Failure, TDAFW Stm Supply Vlv Fails Open		

Time	Position	Applicant's Actions or Behavior
	BOP	**CHECK** Ruptured S/G(s) pressure STABLE or RISING. (Pressure in S/G #1 will be rapidly decreasing due to steamline break, RNO required) **MAINTAIN** pressure of Intact S/Gs used for cooldown at least 250 psi below ruptured S/G(s): • **SLOWLY DUMP** steam from Intact S/Gs • **MAINTAIN** RCS cooldown rate less than 100°F/hr. **IF** Intact S/G(s) used for cooldown CANNOT be maintained at least 250 psi below ruptured S/G(s), **THEN** **GO TO** ECA-3.1, SGTR and LOCA - Subcooled Recovery. *(SRO should transition to ECA-3.1)*

Op Test No.: NRC	Scenario # 2	Event # 8	Page 33 of 41
Event Description:	S/G #1 SteamLine Break outside containment		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 8		
Indications available: • **S/G #1 Pressure decreasing** • **Auto Closure of intact S/G MSIVs**		
	SRO	Enter and direct actions of ECA-3.1, SGTR AND LOCA SUBCOOLED RECOVERY
NOTE	This procedure has a foldout page.	
	RO	**RESET** SI and **CHECK** the following: • SI ACTUATED permissive DARK [M-4A, C4] • AUTO SI BLOCKED permissive LIT [M-4A. D4].
	RO	**MONITOR** shutdown boards energized from start busses.
	RO	**RESET** Phase A and Phase B.
	RO	**CHECK** control air established to containment: [Panel 6K and 6L] • 1-FCV-32-80 (2-FCV-32-81) Train A essential air OPEN • 1-FCV-32-102 (2-FCV-32-103) Train B essential air OPEN • 1-FCV-32-110 (2-FCV-32-111) non-essential air OPEN.

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Event Description: S/G #1 SteamLine Break outside containment

Time	Position	Applicant's Actions or Behavior
	RO	**TURN OFF** pressurizer heaters: a. **PLACE** pressurizer heater handswitches in PULL TO LOCK or OFF as applicable. b. **MONITOR** pressurizer level less than 80%.
	RO	**MONITOR** if containment spray should be stopped: a. **CHECK** any containment spray pump RUNNING.
	RO	**MONITOR** if containment vacuum control should be returned to normal: a. **CHECK** containment pressure less than 1.0 psig. b. **VERIFY** containment vacuum relief isolation valves OPEN: [Panel 6K] • FCV-30-46 • FCV-30-47 • FCV-30-48.
CAUTION		**Feeding a S/G that is Faulted and Ruptured increases the potential for uncontrolled RCS cooldown and S/G overfill. This option should NOT be considered UNLESS needed for RCS cooldown.**

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Event Description: S/G #1 SteamLine Break outside containment

Time	Position	Applicant's Actions or Behavior
	BOP	**MAINTAIN** Ruptured S/G(s) level in narrow range: a. **CHECK** narrow range level greater than 10% [25% ADV]. *(If Not RNO)* a. **IF** ruptured S/G is NOT faulted, **THEN** **PERFORM** the following: b. **STOP** feed flow to Ruptured S/G(s).
	RO	**DETERMINE** if RHR pumps should be stopped: a. **CHECK** RHR pump suction ALIGNED to RWST. b. **CHECK** RCS pressure: • Greater than 300 psig • STABLE or RISING. c. **STOP** RHR pumps and **PLACE** in A-AUTO. d. **MONITOR** RCS pressure greater than 300 psig.
	CREW	**INITIATE** evaluation of plant status: a. **CHECK** Auxiliary Building radiation NORMAL: 1) Area rad monitor recorders RR-90-1A and RR-90-1B NORMAL. 2) Vent monitor RM-90-101 NORMAL. (prior to isolation)

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Event Description: S/G #1 SteamLine Break outside containment

Time	Position	Applicant's Actions or Behavior
	CREW	b. **NOTIFY** TSC to initiate post-accident sampling as necessary. c. **EVALUATE** plant equipment status **USING** EA-0-4, Evaluation of Equipment Status. d. **DISPATCH** personnel to remove power to ice condenser AHUs **USING** EA-201-1, 480 V Board Room Breaker Alignments.
	BOP	**CHECK** S/G secondary pressure boundaries INTACT: • All S/G pressures CONTROLLED or RISING • All S/G pressures greater than 140 psig. *(If not RNO Next Step)*

Op Test No.: NRC Scenario # 2 Event # 8 Page 37 of 41

Event Description: S/G #1 SteamLine Break outside containment

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** Faulted S/G(s) ISOLATED UNLESS needed for cooldown: • MSIVs and MSIV bypasses CLOSED • AFW ISOLATED • MFW ISOLATED • Atmospheric relief CLOSED • S/G blowdown valves CLOSED • Steam supply to TD AFW pump ISOLATED (S/G 1 or 4). **IF** any Faulted S/G NOT isolated **AND** NOT needed for cooldown, **THEN** **GO TO** E-2, Faulted Steam Generator Isolation. *(SRO Should continue in ECA-3.1)*
	BOP	**MAINTAIN** Intact S/G narrow range levels: a. Greater than 10% [25% ADV]. b. Between 20% [25% ADV] and 50%.
	CREW	**MAINTAIN** shutdown margin adequate: a. **NOTIFY** Chem Lab to sample RCS boron concentration. b. **CHECK** shutdown margin ADEQUATE.

Op Test No.: NRC	Scenario # 2	Event # 8	Page 38 of 41
Event Description:	S/G #1 SteamLine Break outside containment		

Time	Position	Applicant's Actions or Behavior

NOTE

- Blocking low steamline pressure SI as soon as pressurizer pressure is less than 1960 psig will prevent an inadvertent MSIV closure and keep the condenser available for steam dump.
- After the low steamline pressure SI signal is blocked, main steamline isolation will occur if the high steam pressure rate is exceeded.
- The 1250 psig RCP trip criterion is NOT applicable after RCS cooldown is initiated in the following step.
- Maintaining a cooldown rate as close as possible to 100°F/hr will balance the need for rapid RCS cooldown against reactor vessel PTS concerns.

Evaluator Note: Since a cooldown has already been performed in E-3, it is likely that only a small amount of additional cooldown, if any, will be required during the first hour since the trip. Tcold at the time of the trip should have been ~547 degrees. Cooldown should be limited such that Tcold is not decreased below ~447 degrees until an hour has elapsed since the trip.

INITIATE RCS cooldown to cold shutdown:

a. **WHEN** RCS pressure less than 1960 psig, **THEN** **PERFORM** the following:

1) **BLOCK** low steamline pressure SI.

2) **CHECK** STEAMLINE PRESS ISOL/SI BLOCK RATE ISOL ENABLE permissive LIT. [M-4A, A4]

b. **MAINTAIN** T-cold cooldown rate less than 100°F/hr.

c. **IF** RHR Shutdown Cooling in service, **THEN** **USE** RHR System.

Scenario may be terminated when cooldown evaluation is complete and cooldown is initiated as required.

Op Test No.: NRC Scenario # 2 Event # ES-0.5 Page 39 of 41

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5 Actions
		VERIFY D/G ERCW supply valves OPEN.
	BOP	**VERIFY** at least four ERCW pumps RUNNING.
	BOP	**VERIFY** CCS pumps RUNNING: • Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	**VERIFY** EGTS fans RUNNING.
	BOP	**VERIFY** generator breakers OPEN.
	BOP	**VERIFY** AFW pumps RUNNING: • MD AFW pumps • TD AFW pump.
		NOTE AFW level control valves should NOT be repositioned if manual action has been taken to control S/G levels, to establish flow due to failure, or to isolate a faulted S/G.
	BOP	**CHECK** AFW valve alignment: a. **VERIFY** MD AFW LCVs in AUTO. b. **VERIFY** TD AFW LCVs OPEN. c. **VERIFY** MD AFW pump recirculation valves FCV-3-400 and FCV-3-401 CLOSED.
	BOP	**VERIFY** MFW Isolation: • MFW pumps TRIPPED • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED

Op Test No.: NRC Scenario # 2 Event # ES-0.5 Page 40 of 41

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** ECCS operation: **VERIFY** ECCS pumps RUNNING: • CCPs • RHR pumps • SI pumps **VERIFY** CCP flow through CCPIT. **CHECK** RCS pressure less than 1500 psig. **VERIFY** SI pump flow. **CHECK** RCS pressure less than 300 psig. **VERIFY** RHR pump flow. *(If Not previously performed A Train RHR and SI pumps should be started in this step)*
	BOP	**VERIFY** ESF systems ALIGNED: • Phase A ACTUATED: o PHASE A TRAIN A alarm LIT [M-6C, B5]. o PHASE A TRAIN B alarm LIT [M-6C, B6]. • Containment Ventilation Isolation ACTUATED: o CONTAINMENT VENTILATION ISOLATION TRAIN A alarm LIT [M-6C, C5]. o CONTAINMENT VENTILATION ISOLATION TRAIN B alarm LIT [M-6C, C6]. • Status monitor panels: o 6C DARK o 6D DARK o 6E LIT OUTSIDE outlined area o 6H DARK o 6J LIT. • Train A status panel 6K: o CNTMT VENT GREEN o PHASE A GREEN • Train B status panel 6L: o CNTMT VENT GREEN o PHASE A GREEN *(Even thought not specifically checked in this step A Train CRI failure may also be addressed at this step)*

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Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** for containment spray and Phase B actuation: a. **CHECK** for any of the following: • Phase B ACTUATED **OR** • Containment pressure greater than 2.8 psig.
	BOP	**CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors • Appendix B, Containment Rad Monitors.
	BOP	**VERIFY** pocket sump pumps STOPPED: [M-15, upper left corner] • HS-77-410, Rx Bldg Aux Floor and Equipment Drain Sump pump A • HS-77-411, Rx Bldg Aux Floor and Equipment Drain Sump pump B.
	BOP	**DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	**ENSURE** plant announcement has been made regarding Reactor Trip and SI.

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Sim. Setup	Reset **IC- 189** Perform switch check. Allow the simulator to run for at least 3 minutes before loading SCEN file or starting the exercise. This will initialize ICS. **Load SCENS: NRC09B** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms.	Initialize simulator at 10^{-3}% RTP. **Place Mode 2 placard on panels.** **Place A Train Week sign on the simulator** **Ensure Intermediate Range Channel N36 any Power Range Channel selected on N45 Recorder.**
Event 1		Increase power to 1-2%
Event 2 When Power Increase complete as Directed by Lead Examiner insert: **Key-1**	imf NI04B f:0 k:1	IR CHANNEL FAILURE IR CHNL 2 (N-36) FAILS LOW ***If IMs or MSS contacted, inform the crew that the IMs will report to the MCR in ~45 minutes.***
Event 3 When IR AOP and Tech Spec complete as Directed by Lead Examiner insert: **Key-2**	imf CV25A f:1 k:2 imf CV16 f:100 d:6 k:2	PT-62-81 FAILS LOW LETDOWN LINE RELIEF VLV FAILS OPEN (RV-62-662) ***If MSS contacted, inform the crew that IMs will report to the MCR in ~45 miutes.*** ***Role play as AUO, Radcon etc. as needed when crew is placing Excess Letdown in service.***
Event 4 When Excess Letdown Flow has been established as Directed by Lead Examiner insert: **Key-3**	imf ED08C f:1 k:3	LOSS OF 480V SHUTDOWN BOARD 1B1-B ***If personnel are dispatched to check the board locally report the normal supply breaker tripped apparently, due to 51 overcurrent relay. Report in ~3 min.*** ***If dispatched to check D/G oil temperature, report temperature of ~99 degrees. Report in ~ 10 min.***

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Event 5 When 480v Bd AOP and Tech Spec complete as Directed by Lead Examiner insert: **Key-4**	imf TH05A f:4.2 k:4	STEAM GENERATOR TUBE FAILURE SG #1 (~200 gpm) ***If RADCON/Chem Lab are requested to survey/sample S/Gs, wait ~20 min then report as RADCON that S/G #1 is slightly higher than background and other S/Gs.*** ***Wait 45 minutes and report as Chem Lab that ruptured S/G is #1 S/G.***
Event 6 Active when SCENS loaded	imf RP16K608A f:1	Failure of Train "A" ESF Equipment to start. No auto Train "A" CR Isolation No auto start of CCP 1A-A (Note: CCP1A-A may have been previously started manually No auto start of SI pump 1A-A No auto start of RHR pump 1A-A No auto start of CCS pump 1A-A (Note: 1A-A CCS pmp already running)
Event 7 Active when SCENS loaded	imf MSCOHS115A f:1 ior ZLOHS115A_RED f:1	LOOP 1 TDAFW PUMP STEAM SUPPLY VALVE 1-FCV-1-15 FAILS OPEN. ***If dispatched to check valve locally report no obvious problem locally. Report in ~8 min.***
Event 8 **Immediately** when E-3 cooldown to target temperature complete as Directed by Lead Examiner insert: **Key-5**	imf MS06A f:25 k:5	MAIN STEAM LINE BREAK OUTSIDE CONTAINMENT - LP1 ***If personnel dispatched to look for steam leak, report steam coming from West Valve Vault room.***
If requested to bypass Con-DI wait ~10 min and insert: **Key-6**	irf CNR02 f:3 k:3 k:6	HS-14-3, COND DEMIN BYPASS VLV (OPEN) ***Report when complete.***
If Requested to Remove PORV fuses wait appropriate time based on method and Use **Key 7**	imf RCCOHS68340AA f:1 k:7	SIMULATE PORV 68-340 FUSE REMOVAL. ***Report complete based on method of performance. If clearance is requested, wait ~45 min, If dispatched to pull fuses wait ~10 min.***

Time: Now Date: Today

Unit 1 MCR Checklist (751-2428 ID 7636)

Part 1 - Completed by Off-going Shift / Reviewed by On-coming Shift	
Mode 2, 10^{-3}% Power 0 MWe **PSA Risk: Green** **Grid Risk: Green** **RCS Leakage ID .02 gpm, UNID .01 gpm** **Cumulative Purge Time 50.5 Hours**	**NRC phone Authentication Code** **Until 0800 H3H8** **After 0800 42DF**

Common Tech Spec Actions

-

U-1 Tech Spec Actions

-

Protected Equipment

-

Shift Priorities

- Plant Startup in progress following 1 week shutdown. O-GO-2 Section 5.3 is complete and Plant is stable at ~10^{-3} % power. Continue reactor startup in accordance with 0-GO-3 Section 5.2, step 1 and stabilize between 1and 2% power. Rx Engineering spreadsheet for power increase above 1 to 2% is being developed and verified and will be provided prior to power increase above that point. The Preconditioned power level is 100%. 1B MFP is designated for startup and 1-SO-2/3-1, Section 5.16.2 "Preparation of Main Feedwater Pump 1B For Startup" is complete.

Part 2 – Performed by on-coming shift		
☒ Verify your current qualifications	☒ Review Operating Log since last held shift or 3 days, whichever is less	
☒ Standing Orders / Shift Orders	☒ TACF	☒ Immediate required reading
☒ LCO Actions		

Part 3 – Performed by both off-going and on-coming shift
☒ Walk down of MCR Control Boards

Time: Now Date: Today

MAIN CONTROL ROOM (7690)
• **Train_A_Week**
OUTSIDE (7666) [593-5214]
•
AUXILIARY BUILDING (7775)
•
TURBINE BUILDING (7771) (593-8455)
•

Time: Now Date: Today

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number	Date Scheduled

MCR WO List

ID And Noun Name	Panel	Problem Description	WO/PER Number	Date Scheduled

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1729** ppm Today		BA Controller Setpoint: **48%** *	RCS B-10 Depletion: **2** ppm
Operable BAT: **A**	BAT A Boron: **6850** ppm	BAT C Boron: **6850** ppm	RWST Boron: **2601** ppm
Nominal Gallons per rod step from 149: **13** gallons of acid, **41** gallons of water			

* Verify boric acid flow controller is set at Adjusted BA Controller Setting iaw 0-SO-62-7 section 5.1

Estimated values for a 1° Change in Tave **

Gallons of acid: **26**	Gallons of water: **138**	Rod Steps: **4**

Estimated rods/boron for emergency step power reduction **

(Assuming Xenon equilibrium and no reactivity effects due to Xenon. 2/3 total reactivity from rods, 1/3 from boron)

Power reduction amount	Estimated Final Rod Position	Estimated boron addition
10%	**198** Steps on bank D	**101** gallons
30%	**174** Steps on bank D	**295** gallons
50%	**152** Steps on bank D	**485** gallons

** These values are approximations and not intended nor expected to be exact. The values may be superseded by Rx Engineering or SO-62-7 calculated values. These values are calculated assuming 100% steady state power operation only. Engineering data last updated **one week ago**. Data Valid until **one week from now**.

Previous Shift Reactivity Manipulations

Number of dilutions: 0	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 0	Gallons per boration: 0	Rod steps out: 0
Total amount diluted: 0	Total amount borated: 0	Net change: 0 IN/Out

Current Shift Estimated Reactivity Manipulations

Number of dilutions: ***	Number of borations: ***	Rod steps in: ***
Gallons per dilution: ***	Gallons per boration: ***	Rod steps out: ***
Total expected dilution: ***	Total expected boration: ***	Net change: *** In/Out

Remarks:

Rx Power – 0% MWD/MTU – 1000

***Reactor Engineering Spreadsheet to be provided.

Next Unit 1 Flux Map is scheduled - three weeks from now

Unit 1 M-P is 0 PPM

Unit Supervisor: _____

Name/Date

Operations Chemistry Information

Boron Results					
Sample Point	**Units**	**Boron**	**Date / Time**	**Goal**	**Limit**
U1 RCS	ppm	1729	Today / Now	Variable	Variable
U2 RCS	ppm	816	Today / Now	Variable	Variable
U1 RWST	ppm	2601	Today / Now	2550 - 2650	2500 - 2700
U2 RWST	ppm	2569	Today / Now	2550 - 2650	2500 - 2700
BAT A	ppm	6850	Today / Now	Variable	Variable
BAT B	ppm	6850	Today / Now	Variable	Variable
BAT C	ppm	6850	Today / Now	Variable	Variable
U1 CLA #1	ppm	2556	Today / Now	2470-2630	2400-2700
U1 CLA #2	ppm	2575	Today / Now	2470-2630	2400-2700
U1 CLA #3	ppm	2591	Today / Now	2470-2630	2400-2700
U1 CLA #4	ppm	2589	Today / Now	2470-2630	2400-2700
U2 CLA #1	ppm	2531	Today / Now	2470-2630	2400-2700
U2 CLA #2	ppm	2650	Today / Now	2470-2630	2400-2700
U2 CLA #3	ppm	2522	Today / Now	2470-2630	2400-2700
U2 CLA #4	ppm	2526	Today / Now	2470-2630	2400-2700
Spent Fuel Pool	ppm	2547	Today / Now	≥ 2050	≥ 2000
Lithium Results				**Goal**	**Midpoint**
U1 RCS Lithium	ppm	1.1	Today / Now	>1	>1
U2 RCS Lithium	ppm	2.43	Today / Now	2.18-2.48	2.33

Primary to Secondary Leakrate Information (Total CPM RM-90-99/119)					
Indicator	**Units**	**U1**	**Date / Time**	**U2**	**Date/Time**
SI 50 S/G Leakage?	Yes/No	No	Today / Now	No	Today / Now
SI 137.5 CVE Leakrate	gpd	< 0.1	Today / Now	< 0.1	Today / Now
5 gpd leak equivalent	cpm	380	Today / Now	68	Today / Now
30 gpd leak equivalent	cpm	1980	Today / Now	83	Today / Now
50 gpd leak equivalent	cpm	3250	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	4850	Today / Now	455	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cpm	50	Today / Now	40	Today / Now
Correction Factor 99/119	cpm/gpd	10.69	Today / Now	14.13	Today / Now

Steady state conditions are necessary for an accurate determination of leak rate using the CVE Rad Monitor

Date_____

5.16.2 Preparation of Main Feedwater Pump 1B for Startup

[1] **ENSURE** MFPT Condenser Drain Tank is in service in accordance with 1-SO-5-4. ☑

[2] **ENSURE** the following sections have been completed and MFP 1A is aligned and ready for start (sequential performance not required)

Description	SECTION	INITIALS
1B MFP Oil Pump Testing	Section 5.10.2	
1B MFP Warm-up	Section 5.11.2	
Placing 1B MFPT on Turning Gear	Section 5.12.2	
1B MFPT – Establishing Vacuum	Section 5.13.2	
1B MFP Trip Test Prior to Startup	Section 5.14.2	
1B MFP Turbine Steam Supply Warm-up	Section 5.15.2	

[3] **RECORD** 1B MFPT initial speed. 10 rpm _____

NOTE **[TIS-46-59]** for MFPT A and **[TIS-46-60]** for MFPT B located on the MFPT local panel may be used as the temperature indicator.

[4] **ADJUST** the MFPT oil temperature leaving the heat exchangers to maintain approximately 110°F.

MFPT	CONTROLLER	✓
B	TIC-24-56B	☑

[5] **ENSURE** available MFPT(s) H-P and L-P steam isolation valves are **OPEN**. **[C.5]**

VALVE	DESCRIPTION	POSITION	✓
1-612	MFPT B HP ISOL	OPEN	☑
1-604	MFPT B LP ISOL	OPEN	☑

Date_____

5.16.2 Preparation of Main Feedwater Pump 1B for Startup (continued)

[6] **IF** MFPT speed change (once HP ISOL is OPEN) is greater than 200 rpm, **THEN**
CONTACT System Engineer to evaluate checking and adjustment of dashpot settings. N/A

[7] **ENSURE** MFPTs H-P and L-P steam isolation bypass valves are **CLOSED**.

VALVE	DESCRIPTION	POSITION	✓
1-608	MFPT B LP BYPASS ISOL	CLOSED	☑
1-614	MFPT B HP BYPASS ISOL	CLOSED	☑

[8] **ENSURE** the following:

MFPT	DESCRIPTION	HANDSWITCH	POSITION	✓
B	Condenser Inlet Isol valve	2-211A	OPEN	☑
	Condenser Outlet Isol valve	2-216A	OPEN	☑

[9] **IF** MFP 1B is first to be started, **THEN**

ENSURE all main feedwater reg valves, bypass reg valves, and controllers are aligned as follows:

DESCRIPTION	CONTROLLER	POSITION	✓	VALVE	INDICATED POSITION	✓
SG-1 Main Reg	FIC-3-35	MANUAL	☑	FCV-3-35	CLOSED	☑
SG-2 Main Reg	FIC-3-48	MANUAL	☑	FCV-3-48	CLOSED	☑
SG-3 Main Reg	FIC-3-90	MANUAL	☑	FCV-3-90	CLOSED	☑
SG-4 Main Reg	FIC-3-103	MANUAL	☑	FCV-3-103	CLOSED	☑
SG-1 Reg Bypass	LIC-3-35	MANUAL	☑	LCV-3-35	ZERO	☑
SG-2 Reg Bypass	LIC-3-48	MANUAL	☑	LCV-3-48	ZERO	☑
SG-3 Reg Bypass	LIC-3-90	MANUAL	☑	LCV-3-90	ZERO	☑
SG-4 Reg Bypass	LIC-3-103	MANUAL	☑	LCV-3-103	ZERO	☑

_____

Date_____

5.16.2 Preparation of Main Feedwater Pump 1B for Startup (continued)

[10] ENSURE main feedwater isolation valves are aligned as follows:

DESCRIPTION	HANDSWITCH	HS POSITION	✓	VALVE POSITION	✓
SG-1 FEEDWATER ISOL	HS-3-33A	A-P AUTO	☑	OPEN	☑
SG-2 FEEDWATER ISOL	HS-3-47A	A-P AUTO	☑	OPEN	☑
SG-3 FEEDWATER ISOL	HS-3-87A	A-P AUTO	☑	OPEN	☑
SG-4 FEEDWATER ISOL	HS-3-100A	A-P AUTO	☑	OPEN	☑

_____

[11] IF MFP 1B is first to be started, **THEN**

[a] ENSURE [1-FIC-3-84] in MANUAL ☑
AND
OPEN [1-FCV-3-84] MFP "B" RECIRC. _____

[b] ENSURE [1-HCV-3-84], Main FW Pump B Bypass Warm-up Valve CLOSED. _____

[c] ENSURE [1-FIC-3-70] in MANUAL ☑
AND
CLOSE [1-FCV-3-70] MFP "A" RECIRC. _____

[12] ENSURE speed controllers for non-running MFPs are aligned as follows:

MFPT	SPEED CONTROLLER	SWITCH POSITION	✓	DEMAND SETPOINT	✓
A	SIC-46-20A	MANUAL	☑	ZERO	☑
B	SIC-46-20B	MANUAL	☑	ZERO	☑

_____

[13] IF MFP 1B is the first to be started, **THEN**

ENSURE MFPT A & B MASTER SPEED CONTROL, [PC-46-20] is in **MANUAL** with **ZERO** demand indication. ☑

End of Section 5.16.2

Sequoyah Nuclear Plant

Unit 1 & 2

General Operating Instructions

0-GO-3

POWER ASCENSION FROM REACTOR CRITICAL TO LESS THAN 5 PERCENT REACTOR POWER

Revision 0021

Quality Related

Level of Use: Continuous Use

Effective Date: 08-29-2008

Responsible Organization: OPS, Operations

Prepared By: Olivia Head

Approved By: D. A. Porter

Current Revision Description

Procedure has been revised to accommodate Tech Spec Change 08-05. (08000986).

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ATTACHMENTS

Attachment 1: Procedure Checklist

1.0 INTRODUCTION

1.1 Purpose

This General Operating (GO) Instruction provides necessary instructions to raise reactor power to approximately 1% for main feed pump startup and to transition from auxiliary feedwater to main feedwater with the feedwater bypass reg. valves in AUTO.

1.2 Scope

A. This GO contains the following sections:

1. 5.1 Actions To Be Performed Prior To Increasing Reactor Power
2. 5.2 Power Ascension To Approximately 1% RTP
3. 5.3 Transferring Feedwater From Auxiliary To Main Feedwater

2.0 REFERENCES

2.1 Performance References

A. 0-SO-1-2, *Steam Dump System*

B. 1,2-SO-15-1,2, *Steam Generator Blowdown*

C. 1,2-SO-5-1, *Feedwater Heaters and Moisture Separator Reheaters*

D. 1,2-SO-5-2, *No. 3 Heater Drain Tank and Pumps*

E. 1,2-SO-5-3, *No. 7 Heater Drain Tank and Pumps*

F. 1,2-SO-5-4, *Feedwater Turbine Condenser Drain Tank and Pumps*

G. 1,2-SO-5-5, *Atmospheric Condensate Drain Sump and Pumps*

H. 1,2-SO-2/3-1, *Condensate and Feedwater System*

I. 1,2-SO-3-2, *Auxiliary Feedwater System*

J. 1,2-SO-1-1, *Main Steam System*

K. MI-20.154 *Controller Tuning Instruction*

L. 1,2-SI-OPS-000-002.0, *Shift Log*

M. 0-RT-NUC-000-001.0, *Restart Test Program*

2.1 Performance References (continued)

N. 0-PI-OPS-000-001.0, *Initial Startup System Parameter Log*

2.2 Developmental References

A. 0-GO-1, *Unit Startup from Cold Shutdown to Hot Standby*

B. 0-GO-4, *Power Ascension from Less Than 5% Reactor Power to 30% Reactor Power*

C. SPP-2.2

D. FSAR Section 13.5

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

A. Reactor Engineering should be contacted for guidance on core operating recommendations during unusual power maneuvers such as startup during end of core life. [C.5]

B. Reactor power should be monitored using the following indications:

1. Average loop ΔT (UO485). Considered to be the most accurate power indication when less than 15% power but greater than Point of Adding Heat.

2. Intermediate Range Indicators(used at or below Point of Adding Heat

3. NIS power range.

4. Steam dump demand. (**REFER TO** graph in 0-SO-1-2).

NOTE

Pressurizer heaters and sprays may be operated, as required, to maintain pressurizer and RCS boron concentration within 50 ppm.

C. The boron concentration in the pressurizer should be maintained within 50 ppm of the RCS by use of pressurizer heaters and spray.

D. Control rod bank D should be ≥ 165 steps at steady state power levels below 85% RTP. This guidance is to preclude long term operation at less than 165 steps to avoid potential impact on safety analysis assumptions. Short term operation at less than 165 steps is **NOT** a concern.

E. The AFW start function for trip of both MFW pumps (LCO 3.3.2.1 (3.3.2) functional unit 6.f) shall be considered INOPERABLE when any MFP trip bus is DE-ENERGIZED OR when any MFP is RESET but is NOT pumping forward. **[C.6]**

F. The AFW start function is required to be operable (both MFWP trip busses energized with non-running pump TRIPPED) <u>prior to pumping forward with the first MFW pump</u>. The only exception is if LCO 3.0.4 (b) can be invoked due to one MFW pump being unavailable. (Refer to 0-TI-OPS-000-911.0)

3.2 Limitations

A. Do **NOT** exceed a steady startup rate of + 1 DPM.

B. After refueling operations, the NIS indications may be inaccurate until calibration at higher power levels. The NIS calibration procedures will adjust the PRM trip setpoints to ensure that the excore detectors do **NOT** contribute to an overpower condition. Prior to startup, the PRM high range flux trip setpoint will be adjusted from 109 to 60%, with the rod stop (C-2) remaining at 103%. [C.2]

C. If fuel defects are present, Preconditioned Power Levels and Maximum Allowable Rates of Power Increase specified in TI-40, *Determination of Preconditioned Reactor Power* shall apply.

Startup Number ____ **Unit** 1 **Date** ____

4.0 PREREQUISITES

NOTES

1) Throughout this Instruction where an **IF/THEN** statement exists, the step should be N/A'd if condition does **NOT** exist.
2) Prerequisites may be completed in any order.
3) This instruction may be entered from a partial shutdown, **N/A** sections **NOT** applicable and annotate reason.

[1] **ENSURE** Instruction to be used is the latest copy of effective version. ____

[2] **ENSURE** Precautions and Limitations have been reviewed. ☑

[3] **ENSURE** main steam system aligned with MSIVs open in accordance with 1,2-SO-1-1. ☑

[4] **ENSURE** the reactor is critical with power at approximately 1×10^{-3}%. ☑

[5] **MAINTAIN** pressurizer pressure within the normal operating band by use of the pressurizer heaters and spray valves. ☑

[6] **MAINTAIN** pressurizer level greater than or equal to 25%. ☑

[7] **MAINTAIN** T_{AVG} stable with the steam dumps in pressure mode or with the SG atmospheric relief valves set at 84% or 1005 psig. ☑

[8] **MAINTAIN** SG levels within the normal operating range using Auxiliary Feedwater. ☑

NOTE

During start up after a cold shutdown the Condensate DI normally will be aligned for full flow polishing until the MSRs are in service.

[9] **ENSURE** Condensate DI polishing operation in accordance with RCL recommendations. ____

Startup Number ____ **Unit** ____ **Date** ____

4.0 PREREQUISITES (continued)

[10] **ENSURE** each performer documents their name and initials:

Print Name	Initials	Print Name	Initials

End of Section

Startup Number _____ **Unit** 1 **Date** _____

5.0 INSTRUCTIONS

CAUTION

Steps of this procedure must be performed sequentially, unless specifically stated otherwise.

5.1 Actions To Be Performed Prior To Increasing Reactor Power

[1] **ENSURE** Section 4.0, Prerequisites complete. _____

NOTE

Steps 5.1[2] through 5.1[7] may be performed in any order.

[2] **ENSURE** two Hotwell pumps in service in accordance with 1,2-SO-2/3-1. ☑

[3] **ENSURE** one condensate booster pump in service in accordance with 1,2-SO-2/3-1. ☑

CAUTION

The potential exists for condensation formation in steam extraction lines when feedwater heaters are isolated.

NOTE

Step 5.1[4] may be performed out of sequence (later) due to plant conditions as approved by the SM.

[4] **ENSURE** secondary plant is aligned for startup in accordance with the following:

INSTRUCTIONS	INITIALS
1,2-SO-5-1, Feedwater Heaters and Moisture Separator Reheaters	
1,2-SO-5-2, No. 3 Heater Drain Tank and Pumps	
1,2-SO-5-3, No. 7 Heater Drain Tank and Pumps	
1,2-SO-5-4, Feedwater Turbine Condenser Drain Tank and Pumps	
1,2-SO-5-5, Atmospheric Condensate Drain Sump and Pumps	

Startup Number ~ **Unit** 1 **Date** ~

5.1 Actions To Be Performed Prior To Increasing Reactor Power (continued)

NOTE

Steps to prepare for MFPT startup may be performed in parallel with power ascension to 1-2%.

[5] **IF** any MFPT trip buss is **NOT** energized, **THEN**

[5.1] **REFER** to 0-TI-OPS-000-911.0, Instructions for using TS/TR 3.0.4 (b). N/A

[5.2] **NOTIFY** US/SRO that no MFWP may be placed in service UNLESS LCO 3.0.4 (b) can be invoked. N/A

[6] **WHEN** MFPT designated for startup is available, **THEN**

PERFORM 1,2-SO-2/3-1, Preparation of Main Feedwater Pumps for Startup. (**N/A** if previously performed) ☑

[7] **IF** startup is on Unit 2, **AND**

Secondary System Boric Acid Injection has been in service, **THEN**

ENSURE System has been removed from service in accordance with 0-SO-36-3, *Secondary System Boric Acid Injection*. N/A

End of Section

Startup Number_____ Unit _____ Date _____

5.2 Power Ascension To Approximately 1% RTP

NOTE

Average loop ΔT (UO485) is considered to be the most accurate power indication below 15% power but greater than the Point of Adding Heat. IRM should be used at or below Point of Adding Heat NIS power range and steam dump demand should also be monitored. (**REFER TO** 0-SO-1-2 for steam dump demand program.) [C.3]

[1] **WITHDRAW RODS OR DILUTE** to bring reactor power to between 1 and 2% RTP, while continuing with this instruction. ☐

NOTE

After refueling operations the "Initial Startup System Parameter Log" is performed during power escalations to provide the operator with alternate indications of power level (indications independent of calorimetric calculations). If significant differences occur (approx. 5%) between the alternate power indications then Engineering should be notified.

[2] **IF** startup is after a refueling or maintenance on NIS, **THEN**

INITIATE performance of 0-PI-OPS-000-001.0, *Initial Startup System Parameter Log.* [C.3] ☐

[3] **COMPARE** NIS power range instrumentation with loop ΔT indicators and steam dump demand to evaluate accuracy of PRMs. [C.3] ☐

[4] **SELECT** the highest reading IRM or ΔI and PRM channels to be recorded on NR 45. [C.3] ☐

[5] **REVIEW** plant parameters and indications to determine plant stability prior to startup of Main Feed Pump. ☐

[6] **MAINTAIN** reactor power approximately 1%. ☐

Startup Number_____ **Unit** _____ **Date** _____

5.2 Power Ascension To Approximately 1% RTP (continued)

NOTE

Steps 5.2[7] and 5.2[8] may be performed in any order.

[7] **WHEN** total Aux FW flow to SGs 1 and 2 is constant and greater than or equal to 300 gpm, **THEN**

CLOSE [FCV-3-400], AFW PUMP A RECIRC ISOL VLV, and **PLACE** handswitch **[HS-3-400A]** in the PULL TO LOCK position.

_____ 1st

_____ IV

[8] **WHEN** total Aux FW flow to SGs 3 and 4 is constant and greater than or equal to 300 gpm, **THEN**

CLOSE [FCV-3-401], AFW PUMP B RECIRC ISOL VLV, and **PLACE** handswitch **[HS-3-401A]** in the PULL TO LOCK position.

_____ 1st

_____ IV

NOTE

Control rod bank D should be ≥ 165 steps at steady state power levels below 85% RTP. This guidance is to preclude long term operation at < 165 steps to avoid potential impact on safety analysis assumptions. Short term operation at < 165 steps is **NOT** a concern.

[9] **ENSURE** the plant is stabilized between 1 and 2% reactor power. [C.1] [C.3] ☐

[10] **COMPARE** NIS intermediate range instrumentation with loop ΔT indications to evaluate accuracy of IRM's. [C.1] ☐

[11] **RECORD** IRM readings: [C.3]

N35 _____ % RTP ☐

N36 _____ % RTP ☐

Startup Number_____ **Unit** _____ **Date** _____

5.2 Power Ascension To Approximately 1% RTP (continued)

NOTE

Step 5.2[12] may be performed out of sequence or in parallel with subsequent steps.

[12] **OPEN** Turbine Exhaust Hood cooling valves **[FSV-47-215A, -215B, -215C]** by placing **[HS-47-215]**, in ON position. [located on LP Htr Mezz] _____

[13] **WHEN** startup of the first MFPT is desired, **THEN**

PROCEED with step 5.2[14]. _____

NOTE

The following steps ensure MFPT trip busses energized and MFPTs reset if entering from 0-GO-2 with no MFPT available.

[14] **ENSURE** MFPT designated for startup has been tested and ready for start up per 1, 2-SO-2/3-1 **PRIOR** to proceeding with the next step.

Initials	Date	Time

Startup Number_____ **Unit** _____ **Date** _____

5.2 Power Ascension To Approximately 1% RTP (continued)

NOTE
If both MFPT trip busses are de-energized, power should be placed on only **ONE** trip bus to prevent inadvertent AFWP start.

[15] **IF** both MFPT trip busses de-energized, **THEN**

RESTORE power to **ONLY ONE** MFPT trip bus on the applicable unit. (**N/A** breakers **NOT** applicable.) [C.1]

PUMP	BREAKER NO.	ELECTRICAL BOARD	BREAKER POSITION	INITIALS
MFPT 1A	1-BKRD-46-KA/523	250v DC Battery Bd I	CLOSED	_____ 1st _____ CV
MFPT 1B	1-BKRD-46-KA/524	250v DC Battery Bd I	CLOSED	_____ 1st _____ CV
MFPT 2A	2-BKRD-46-KB/523	250v DC Battery Bd 2	CLOSED	_____ 1st _____ CV
MFPT 2B	2-BKRD-46-KB/524	250v DC Battery Bd 2	CLOSED	_____ 1st _____ CV

Startup Number_____ Unit _____ Date _____

5.2 Power Ascension To Approximately 1% RTP (continued)

CAUTION

Failure to reset a MFPT prior to energizing the remaining MFPT trip buss will initiate an ESF actuation.

NOTE

If an SI signal or a Hi/Hi steam generator level has occurred, the Reactor Trip Breakers will have to be cycled.

[16] **ENSURE** at least one energized MFPT trip bus is RESET.

_____	_____	_____
Initials	Date	Time
_____	_____	_____
CV	Date	Time

[17] **IF** one MFW pump is NOT available,
THEN
PERFORM the following:

[17.1] **ENSURE** requirements of 0-TI-OPS-000-911.0 are met for using LCO 3.0.4 (b). _____ SM

[17.2] **MARK** steps 5.2[18] and 5.2[19] as N/A. _____

Startup Number_____ **Unit** _____ **Date** _____

5.2 Power Ascension To Approximately 1% RTP (continued)

[18] **ENSURE** power to the remaining MFPT Trip Bus on the applicable unit. (**N/A** breakers **NOT** applicable)

PUMP	BREAKER NO.	ELECTRICAL BOARD	BREAKER POSITION	INITIALS
MFPT 1A	1-BKRD-46-KA/523	250v DC Battery Bd I	CLOSED	_____ 1st _____ CV
MFPT 1B	1-BKRD-46-KA/524	250v DC Battery Bd I	CLOSED	_____ 1st _____ CV
MFPT 2A	2-BKRD-46-KB/523	250v DC Battery Bd 2	CLOSED	_____ 1st _____ CV
MFPT 2B	2-BKRD-46-KB/524	250v DC Battery Bd 2	CLOSED	_____ 1st _____ CV

[19] **ENSURE** second MFPT is RESET.

_____	_____	_____
Initials	Date	Time
_____	_____	_____
CV	Date	Time

Startup Number_____ Unit _____ Date _____

5.2 Power Ascension To Approximately 1% RTP (continued)

CAUTION

The first MFW pump shall NOT be placed in service to S/Gs (pumping forward) UNTIL second MFP is TRIPPED in Step 5.2[22]. (Ref: LCO 3.3.2.1 or 3.3.2) The only exception is if LCO 3.0.4 (b) is being invoked due to inavailability of the second MFP.

[20] **ENSURE** the bypass reg. valves are in **MANUAL AND CLOSED**. [C.4]

DESCRIPTION	CONTROLLER	POSITION	√
SG-1 Reg Bypass Flow Control	LIC-3-35	MANUAL AND CLOSED	☐
SG-2 Reg Bypass Flow Control	LIC-3-48	MANUAL AND CLOSED	☐
SG-3 Reg Bypass Flow Control	LIC-3-90	MANUAL AND CLOSED	☐
SG-4 Reg Bypass Flow Control	LIC-3-103	MANUAL AND CLOSED	☐

[21] **START** the first MFPT in accordance with 1,2-SO-2/3-1. ☐

Startup Number_____ Unit _____ Date _____

5.2 Power Ascension To Approximately 1% RTP (continued)

NOTE

The following step will assure that a trip of the running MFP will initiate an AFW pump auto start. (Ref: TS LCO 3.3.2.1 and 3.3.2, PER 03-006930-000).

[22] **IF** the **NON**-running MFPT trip buss is energized,
THEN
TRIP the NON-running MFPT: (**N/A** the running MFPT)

MFPT	HANDSWITCH	INITIALS	CV
A	HS-46-9A		
B	HS-46-36A		

End of Section

Facility:	Sequoyah	Scenario No.:	3	Op Test No.:	NRC
Examiners:		Operators:			

Initial Conditions: 100% Power BOL

1A-A RHR Pump Out of Service.

Turnover: Maintain Current Plant conditions.

Target CTs: Trip Reactor Coolant Pumps based on 1250 psi RCP Trip Criteria prior to exiting E-0.

Initiate at least one train of Phase A Containment isolation prior to completion of ES-0.5.

Operate/Stop containment Spray pumps in accordance with ECA-1.1 to minimize RWST outflow prior to initiating RCS cooldown to cold shutdown in ECA-1.1.

Event #	Malf. No.	Event Type*	Event Description
1	ED120B1B 007	TS-SRO	120 Vac Vital power breaker to lower Containment radiation monitor 1-RM-90-106 trips. SRO Tech Spec Evaluation.
2	CH01C	TS-SRO	Containment pressure instrument fails high requiring implementation of AOP-I.05. SRO Tech Spec Evaluation.
3	HD03A HD06A	C-SRO/BOP	Number 3 Heater Drain Tank (HDT) pump A trips resulting in #3 HDT bypass to condenser valve opening and sticking partially open resulting in plant runback. AOP-S.04 performance required including BOP reset of main turbine and steam dump controls.
4	RD09	C-SRO/ATC	Control Rods fail to move in Auto during plant runback. ATC manually controls rods to control RCS temperature. If time allows, SRO may also implement AOP-C.01 as time allows prior to the next event.
5	RX20	C-SRO/BOP	Steam header pressure transmitter PT-1-33 fails high increasing MFP speed and requiring manual control of MFP.
6	RC05 TH04A	C-SRO/ATC	Przr PORV 68-334 fails 50% open. Przr safety valve 68-563 develops small leak (~13 gpm) when PORV block valve 68-333 is closed. Requires performance of AOP-R.05 and manual control of charging. Leak also requires rapid plant shutdown.
7	N/A	R-ATC N-SRO/BOP	Perform rapid plant shutdown using AOP-C.03. Manual Rod control and MFW pump speed control will be required.
8	TH04A TH01B	M-All	Leaking Pressurizer safety valve fails full open requiring Reactor Trip and Safety Injection.
9	RH01B	C-SRO/ATC	1B-B RHR pump trips on start from SI. With 1B-B RHR pump out of service containment sump recirculation capability is lost which eventually requires implementation of ECA-1.1.
10	RP17A RP17B	C-SRO/ATC	Both trains of Phase A Containment Isolation fail to automatically actuate. Manual actuation of at least one train of isolation is required.
11	CSCOHS7 210A	N/A	1B Containment spray pump will not start automatically or manually.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 3 Summary

Crew will assume shift at 100% power BOL with the Train A RHR pump out of service for repairs. Crew directions will be to maintain current plant conditions.

Shortly after assuming shift, 120 Vac vital power supply breaker to lower containment radiation monitor 1-RM-90-106 will trip. BOP should refer to annunciator response procedures and dispatch personnel to check the power board and radiation monitor. SRO will evaluate Radiation monitoring and RCS leakage detection instrumentation Tech Specs.

After Tech Spec evaluation is complete, containment pressure instrument will fail high requiring implementation of AOP-I.05. SRO will evaluate and apply Reactor Trip, ESF and Post Accident Monitoring instrumentation Tech Specs.

After AOP and Tech Spec Evaluation are complete, Number 3 Heater Drain Tank Pump A will trip. Increasing #3 Heater Tank level will result in bypass to condenser valve 1-LCV-6-105A opening which sticks partially open eventually resulting in low #3 HDT level and reduced HDT return flow to the condensate system below the runback criteria. A BOP automatic plant runback will occur. During the runback, automatic rod insertion will not work requiring manual rod control for RCS Temperature control. Following the runback, AOP-S.04 will require resetting turbine controls and steam dump controls. If time allows prior to the next event SRO may begin implementation of AOP-C.01 which contains minimal actions that can be taken for this event.

When turbine and steam dump controls have been reset from the runback, Main Steam Header pressure transmitter PT-1-33 fails high. Speed of both Main Feedwater pumps will increase to attempt to increase D/P between Main Steam Header and Feedwater pressure. Manual control of MFW pump is required SRO will implement AOP-S.01.

When Main Feedwater pump speed and S/G levels are controlled, Pressurizer PORV PCV-68-334 fails 50% open requiring manual of PORV block valve FCV-68-333. When PORV block valve is closed, Pressurizer safety valve SV-68-563 develops a leak of ~13 gpm. Crew will diagnose the leak and enter AOP-R.05 for RCS leakage. Charging flow adjustments will be required and a leak rate estimate will be required to determine that the leak exceeds Tech Spec limits and Rapid plant shutdown is required. Rapid plant shutdown will be initiated using AOP-C.03.

After the rapid shutdown has resulted in sufficient power reduction, the leaking Przr safety valve will fail full open requiring reactor trip and safety injection. RCS pressure will reach the 1250 psi Reactor Coolant pump trip criteria setpoint. At this point, timely RCP trip is required to complete the first critical task.

When SI is actuated, both trains of Phase A Containment Isolation fail to automatically actuate. Since the Pressurizer Relief Tank ruptures shortly after the SV fails open, at least one train of containment isolation is required to ensure leakage from the containment is minimized. Timely manual actuation of Phase A containment isolation (at least one train) is required to complete the second critical task.

Also, when Safety Injection is actuated the only operable RHR pump (1B-B) trips on overcurrent. With both RHR pumps unavailable transition to ECA-1.1 due to loss of containment sump recirculation capability will eventually be required. When Phase B containment pressure is reached the 1B Containment Spray pump will not start automatically of manually. Depending on crew specific timing, they may progress through E-0, E-1, FR-Z.1, and ES-1.3 prior to entering or during performance of ECA-1.1. In ECA-1.1, crew will ensure the operating containment spray pump is stopped to conserve RWST inventory to complete the last critical task.

The scenario may be terminated after the operating Containment Spray pump is shutdown as required in ECA-1.1.

Op Test No.:	NRC	Scenario #	3	Event #	1	Page	1	of 62

Event Description: 120 Volt Vital A/C Breaker to Lower Cntmnt Rad Monitor RM-90-106 Trips

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 1		
Indications available: • Alarm XA-55-1C, A-7 "120V AC VITAL PWR BD 1-I UV OR BKR TRIP" • Alarm XA-55-12A, A-4 "1-RA-90-106A CNTMT BLDG LWR COMPT AIR MON HIGH RAD" • Alarm XA-55-12A, A-5 "1-RA-90-106B CNTMT BLDG LWR COMPT AIR MON GAS INSTR MALF" • Alarm XA-55-12A, A-6 "1-RA-90-106C CNTMT BLDG LWR COMPT AIR MON PART INSTR MALF" • Flow light Dark on RI-90-106A (M-12)		
Evaluator Note: Primary response is contained in two Annunciator Response Procedures. One is for the Breaker trip the other is for the radiation monitor instrument malfunction. Applicable steps from each are listed below.		
	Crew	Refer to Annunciator Response Procedures for Vital Board I Breaker Trip.
	BOP	**[1] DISPATCH** personnel to **CHECK** 120V AC Vital Power Bd 1-I for the following: **[a]** Local voltmeter indicating power available. **[b]** Voltage potential lamps (amber) ILLUMINATED **[c]** Tripped or open breakers on panel. **[d]** Any blown fuses in rear of board.
	CREW	Refer to Annunciator Response Procedures for Rad Monitor Gas or Particulate Instrument Malfunction.
	BOP	**CHECK** 1-RI-90-106 on 0-M-12 for indication of malfunction. **DISPATCH** operator to 1-RE-90-106 to check following: **[a]** Valves aligned properly **[b]** Low flow indication on 1-FIS-90-106 **[c]** Pump failure **[d]** **[1-HS-90-106]** Heat Trace circuit handswitch, (Heat Trace Control station adjacent to 1-RM-90-106, -112) in **ON** position.

Op Test No.:	NRC	Scenario #	3	Event #	1	Page	2	of 62
Event Description:	120 Volt Vital A/C Breaker to Lower Cntmnt Rad Monitor RM-90-106 Trips							

Time	Position	Applicant's Actions or Behavior
	SRO	**EVALUATE** Technical Specifications 3.3.3.1, 3.4.6.1 and 3.4.6.2. 3.3.3.1 Radiation Monitoring Instrumentation: **Action b. requires Action 27 of Table 3.3-6 item 2.b.i & ii. (Action 27 requires compliance with action of 3.4.6.1 below)** 3.4.6.1a RCS Leakage Detection Instrumentation. **Action b. Applies. (30 days with grab samples of lower containment)** 3.4.6.2 RCS Leakage Operational Leakage: **N/A**
	CREW	**IF** 1-RE-90-106 inoperable, **THEN** **ALIGN** 1-RE-90-112 to lower containment in accordance with 1-SO-90-2, *Gaseous Process Radiation Monitoring System.*
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
When Tech Spec Evaluation complete lead examiner may cue the next event.		

Op Test No.: NRC Scenario # 3 Event # 2 Page 3 of 62

Event Description: Cntmnt Press Transmitter PT-30-44 Fails to 100%

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 2		
Indications available: • Alarm XA-55-6B, A-6 "PDS-30-42-B/A CONTAINMENT HIGH PRESSURE S.I. ACTUATE • Alarm XA-55-6B A-7 "PDS-30-42A CONTAINMENT HI-HI PRESSURE STEAMLINE ISOL • Indicator PDI-30-44 on M-6 Failed upscale • Blue Light for S/G Level Adverse SP Prot Set II Lit on M-4 (XI-3-204) • Alarm XA-55-3C, E-2 "STM GEN LEVEL ADVERSE SETPOINT		
	SRO	Implement actions of AOP-I.05
	SRO	*(Tech Spec Evaluation will probably not be done until AOP actions are complete)* **EVALUATE** the following Tech Specs for applicability: • 3.3.1.1 (3.3.1), Reactor Trip System Instrumentation **Action 11 from Table 3.3-1 item 14.D. Applies** • 3.3.2.1 (3.3.2), Engineered Safety Feature Actuation System Instrumentation **Action 17 Applies from Table 3.3-3 item 1.c** **Action 18 Applies from Table 3.3-3 items 2.c, 3.b.3, & 4.c** **Action 38 Applies from Table 3.3-3 Items 6.c.i.d & 6.c.ii.d.** • 3.3.3.7, Accident Monitoring Instrumentation **Action 1a from Table 3.3-10 item 4 Applies**
	SRO	**DIAGNOSE** the failure: Containment pressure instrument malfunction *(Go To Section 2.1)*
NOTE:	A high channel failure (or removing the failed channel from service) will result in actuation of the SG LEVEL ADVERSE SETPOINT alarm [M-3C, E-2]. However, level in any SG must still decrease to the normal low-low setpoint (10.7%) to cause a reactor trip/AFW actuation.	

Op Test No.: NRC Scenario # 3 Event # 2 Page 4 of 62

Event Description: Cntmnt Press Transmitter PT-30-44 Fails to 100%

Time	Position	Applicant's Actions or Behavior
	CREW	**NOTIFY** MIG to remove failed pressure instrument from service **USING** appropriate Appendix:

INST NUMBER	PROT CH	APPENDIX
P-30-42 (P-934)	IV	A
P-30-43 (P-935)	III	B
P-30-44 (P-936)	II	C
P-30-45 (P-937)	I	D

(Appendix C is applicable)

		GO TO appropriate plant procedure.
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

When Tech Spec Evaluation is complete lead examiner may cue the next event.

Op Test No.:	NRC	Scenario #	3	Event #	3 & 4	Page	5	of 62

Event Description: Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail

Time	Position	Applicant's Actions or Behavior

Console Operator: When directed, initiate Event 3

Indications available:

#3 Heater Drain Tank Pump A Trip:

- White light on associated handswitch HS-6-112A (M-2) and Buzzer
- Alarm XA-55-1B, E-3 "MOTOR TRIPOUT PANEL 1-M-1 THRU 1-M-6
- Alarm XA-55-2C, B-7 "ZS-6-105A & B NO 3 HTR DR TK BYPASS TO COND

Runback:

- Alarm XA-55-2A, B-1 "TURBINE RUNBACK BOP
- Generator Megawatts decreasing

Auto Rod Failure:

- Megawatts decreasing with no rod insertion

Evaluator Note: Runback does not occur immediately when #3 HDT pump trips. Bypass valve failure will eventually result in reducing #3 HDT discharge flow to less than 5500 gpm as #3 HDT level decreases due to excessive bypass flow. The Runback will be delayed 2-3 minutes from the time of the pump trip.

Evaluator Note: SRO will begin in AOP-S.04 however when Runback occurs and rods do not insert, he may transition to AOP-C.01 during the performance of AOP-S.04 and delegate completion of (Hand off) AOP-S.04 to another operator. Steps from AOP-S.04 immediately follow in this event guide. **Steps from AOP-C.04 follow and begin on page 10 of this event guide.** 1 Rdb

Evaluator Note: Manual rod insertion may result in receiving the ROD CONTROL BANKS LIMIT LOW-LOW alarm XA-55-4B, B-7. If this occurs emergency boration may be established in accordance with the ARP. **Steps from the ARP are included on the page 7** of this event guide where the alarm is checked in AOP-S.04.

	BOP	Refer to AOP for motor trip out alarm
	SRO	Enter and Direct actions of AOP-S.04 Section 2.1
	BOP	**MONITOR** at least one #3 HDT pump RUNNING.

NOTE: Turbine runback will occur if the following conditions met:

- #3 HDT bypass valve, LCV-6-105A or 105B, is OPEN
- turbine load is greater than 81% (Unit 1) or 82% (Unit 2)
- #3 HDT pump discharge flow, FS-6-107, less than 5500 gpm for greater than 10 seconds.

Op Test No.:	NRC	Scenario #	3	Event #	3 & 4	Page 6	of 62
Event Description:	Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail						

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** for turbine runback conditions: a. Turbine load greater than 81% (Unit 1) or 82% (Unit 2). b. #3 Heater Drain Tank Outlet Flow less than 5500 gpm. [M-2, FR-6-107] *(RNO until Runback actually occurs))* b. **GO TO** Step 6. *(Skip c. until Runback occurs. Continue where noted next page)* c. LCV-6-105A or 105B OPEN. [M-2]
Evaluator Note: Following 3 steps will not be performed until runback actually occurs.		
	BOP	**VERIFY** turbine runback to less than or equal to 77% turbine load (approximately 940 MWE).
	RO	**CHECK** rods controlling in AUTO. *(Manual insertion required when runback occurs)*

Op Test No.: NRC Scenario # 3 Event # 3 & 4 Page 7 of 62

Event Description: Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail

Time	Position	Applicant's Actions or Behavior
	RO	**MONITOR** control rods above insertion limit: • ROD CONTROL BANKS LIMIT LOW-LOW alarm DARK. [M4-B, B-7] *(The following steps are from the associated ARP if needed)* **[1] IF** alarm has been verified as being valid (Plant Computer and/or COLR), **AND** **UNIT** is in Mode 1 or Mode 2 with reactor critical, **THEN IMMEDIATELY INITIATE** boration by performing the following: **[a] PLACE** BA transfer pump aligned to blender in FAST speed. **[b] ADJUST** FCV-62-138 as necessary to establish boration flow greater than or equal to 35 gpm from BAT (at least 6120 ppm). *(Steps c. and d. are N/A)* **[e] IF** control rods are in MANUAL, **THEN** **OPERATE** rods manually as necessary to maintain T-avg with 3°F of T-ref. **[f] CONTINUE** boration UNTIL control rods are within limits of Tech Spec LCO 3.1.3.6. **[g] WHEN** control rods are verified to be above the low-low insertion limit, **THEN** **REDUCE** or **STOP** boration flow as required. **[h] WHEN** boration complete, **THEN** **ENSURE** the following: • FCV-62-138 CLOSED. • BA transfer pump(s) in slow speed.
Evaluator Note: Continue at this step until runback occurs.		
CAUTION:		**Feedwater temperature changes may impact core thermal power.**
	BOP	**MONITOR** S/G levels returning to program.
NOTE:		An auto valve closure for LCV-6-106B exists if any one of three #3 Heater Drain Tank Pumps trip and turbine load is greater than 81% (Unit 1) or 82% (Unit 2).
	BOP	**CHECK** LS-6-111 #3 HEATER DRAIN TANK LEVEL ABNORMAL alarm, DARK. [M-2C, A1]

Op Test No.:	NRC	Scenario #	3	Event #	3 & 4	Page	8	of 62
Event Description:	Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail							

Time	Position	Applicant's Actions or Behavior
	CREW	**ENSURE** the following conditions STABLE: • Reactor power • Turbine load
CAUTION:		**Reducing turbine load too rapidly could result in further drop in condensate pressure due to reduction in heater drain flow. Recommended load rate is 1% per minute if turbine load reduction is needed.**
	BOP	**MONITOR** Feedwater pump inlet pressure greater than 320 psig. [M-3, PI-2-129]
	BOP	**MONITOR** Condensate Booster pump suction pressure greater than 100 psig. [M-3, PI-2-77]
	CREW	**DISPATCH** an operator to investigate cause of #3 Heater Drain Tank Pump trip.
	CREW	**NOTIFY** Maintenance to investigate and repair pump malfunction as necessary.
		CHECK VALVE POSITION LIMIT light DARK on 1(2)-XX-47-2000, EHC DISPLAY. *(RNO)* **RESTORE** turbine controls to normal **USING** Appendix B, Turbine Runback Restoration.
NOTE:		Steam dump load rejection circuit may require several minutes decay time before C-7 can be reset.

Op Test No.:	NRC	Scenario #	3	Event #	3 & 4	Page	9	of 62

Event Description: Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail

Time	Position	Applicant's Actions or Behavior
	BOP	**IF** C-7 Interlock LIT, **THEN** **RESET** Load Rejection Signal: a. **PLACE** HS-1-103A and 103B, Steam Dump Control, in OFF. b. **PLACE** HS-1-103D, Steam Dump Control, in RESET and **VERIFY** spring return to TAVG. c. **VERIFY** C-7, LOSS OF LOAD INTERLOCK alarm, DARK. [M-4A, 5E] d. **ENSURE** Steam Dump demand is ZERO. e. **PLACE** HS-1-103A and 103B, Steam Dump Control, in ON.
	RO	**CHECK** reactor power less than 95 %.
	SRO	**GO TO** appropriate plant procedure. *(SRO may address AOP-C.01 for the Auto Rod Failure at this time. AOP-C.01 performance not required for this scenario, however the applicable steps are included on the next page for information)*
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
When Turbine controls have been restored and Steam Sump C-7 Interlock has been reset, lead examiner may cue the next event. **NOTE:** NEXT EVENT BEGINS ON PAGE 12.		

Op Test No.:	NRC	Scenario #	3	Event #	3 & 4	Page	10	of 62
Event Description:	Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail							

Time	Position	Applicant's Actions or Behavior
Evaluator Note:		The following steps are from **AOP-C.01** for rod insertion failure. Note all steps may not be complete prior to next event.
	SRO	Enter and Direct actions of AOP-C.01, Section 2.5 "Rod Control Urgent Failure Alarm or Failure of Control Bank to Move"
CAUTION 1:		**Control Rods should NOT be manually withdrawn during a transient.**
CAUTION 2:		**Attempting to move control rods with ROD CONTROL SYSTEM URGENT FAILURE alarm could result in dropped or misaligned rods.**
CAUTION 3:		**Depressing ROD URGENT FAILURE RESET pushbutton on M-4 prior to determining and correcting cause could result in dropped rods.**
	RO	**CHECK** ROD CONTROL SYSTEM URGENT FAILURE alarm LIT. [M-4B, window A-6] *(RNO)* **IF** ROD CONTROL SYSTEM URGENT FAILURE alarm is NOT LIT, **THEN** **PERFORM** the following: a. **ENSURE** rod control in MAN. b. **GO TO** Step 17.
		17. **CONTROL** T-avg within 3°F of T-ref by performing one of the following: • **POSITION** control rods OR • **ADJUST** turbine load OR • **ADJUST** RCS boron concentration **USING** 0-SO-62-7.
		MONITOR following parameters STABLE or CONTROLLED: • reactor power • T-avg

Op Test No.: NRC Scenario # 3 Event # 3 & 4 Page 11 of 62

Event Description: Plant Runback #3 HDTP A Trip, HDT Bypass vlv fail 60%, Control Rod Auto fail

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK** the following rod stop alarm windows DARK: • IRS INTERMED RANGE HI FLUX LVL ROD WITHDRAWAL STOP alarm [M-4B, B2] • NIS POWER RANGE OVERPOWER ROD WITHDRAWAL STOP alarm [M-4B, D3] • C-3 OVERTEMP ΔT ROD STOP AND TURB RUNBACK [M-4A, E1] • C-4 OVERPOWER ΔT ROD STOP AND TURB RUNBACK [M-4A, E2].
	BOP	**CHECK** C-5 LOW TURB IMPULSE PRESS ROD WITHDRAWAL BLOCKED permissive DARK. [M-4A, E3]
	RO	**CHECK** BANK D AUTO ROD WITHDRAWAL BLOCKED permissive DARK. [M-4B, C7].
	RO	**RESTORE** T-avg and Delta flux (ΔI) to normal **USING** any of the following: • Manual rod control • RCS boration or dilution • Turbine load reduction.
		CHECK rod control repairs COMPLETE. *(RNO will not be performed since rods will not be repaired during scenario)*

Op Test No.: NRC	Scenario # 3	Event # 5	Page 12 of 62
Event Description:	Steam Hdr Pressure Transmitter PT-1-33 Fails High		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 5		
Indications available: • Alarm XA-55-3C, C-1 "PS-3-4 NO 1 FW HTR PRESSURE HI" • Indicator PI-1-33 on M-4 Failed upscale. • Main Feedwater Pump speed increasing		
	SRO	Enter and direct performance of AOP-S.01, Section 2.2.
NOTE	Step 1 is an IMMEDIATE ACTION.	
	BOP	**RESTORE** feedwater pressure: a. **PLACE** affected MFP speed controller(s) in MANUAL: • MFPT 1A(2A) & 1B(2B) Speed Control **OR** • MFPT 1A(2A) Speed Controller **OR** • MFPT 1B(2B) Speed Controller b. **ADJUST** speed on affected MFP(s) to restore feedwater pressure to normal (~1040 psig at full power). *(Main Feed Pump Speed will need to remain in manual for the rest of the scenario)*

Op Test No.: NRC Scenario # 3 Event # 5 Page 13 of 62

Event Description: Steam Hdr Pressure Transmitter PT-1-33 Fails High

Time	Position	Applicant's Actions or Behavior
	BOP	**DETERMINE** if MFP trip is needed: a. **CHECK** BOTH MFWPs in service. b. **IF** MFW pump trip is needed due to loss of speed control, **THEN** **PERFORM** the following: 1) **TRIP** affected MFP. 2) **GO TO** applicable section: *(MFP Trip not required)*
CAUTION:	**Feed flow transients may impact core thermal power.**	
	BOP	**MAINTAIN** steam generator level(s) on program.
NOTE:	Appendix C may be used to determine program feedwater D/P for current power.	
	BOP	**MAINTAIN** MFP discharge pressure on program **USING** ICS or available control board indications.
CAUTION	**Reactor operation at low power levels for extended periods may challenge reactivity control due to xenon changes.**	
	RO	**CHECK** Reactor power greater than 5%.
	CREW	**INITIATE** repairs on failed equipment.
	SRO	**GO TO** appropriate plant procedure.
Evaluator Note:	The following Crew Brief and Notification actions are not contained in the procedure.	
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Lead Examiner may cue the next event when desired.

Op Test No.: NRC	Scenario # 3	Event # 6	Page 14 of 62
Event Description:	PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 6		
Indications Available: **PORV Failure:** • Alarm XA-55-5C, B-6, "XS-68-363 PRESSURIZER RELIEF VALVE OPEN" • Alarm XA-55-5A, E2, "PRESSURIZER POWER RELIEF LINE TEMP HIGH" • PORV 334 position indication extinguished • Acoustic monitors on M4 indicate flow • Tailpipe temperature indicator TI-68-331 increasing on M-4 • RCS Press decrease **Safety Valve Failure:** • Alarm XA-55-5A, D-2 "TS-68-328 PRESSURIZER SAFETY VALVE LINES TEMP HIGH • Safety Valve Acoustic Monitor indication increasing (~50%) XX-68-363A on M-4 • Tailpipe temperature indicator TI-68-330 increasing on M-4 • RCS Press decrease		
Evaluator Note: In this event, the safety valve fails when the PORV block valve is closed. Multiple procedures may apply for these failures. These include applicable ARP, AOP-I.04 for failed open PORV, and AOP-R.05 for the failed Safety valve. Steps from each are included below. SRO may delegate a procedure performance to an Operator. Steps from the **ARP (See Page 15), AOP-I.04 (See Page 15), and AOP-R.05 (See Page 17)** are included in this order in the Event guide.		
	RO	Take immediate/prudent action to close PORV Block Valve. May also attempt to close the open PORV as well.

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Event Description: PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm

Time	Position	Applicant's Actions or Behavior
Evaluator Note: The following steps are from the **Annunciator Response Procedure**.		
	RO	Refer to actions in Annunciator Response Procedure for XA-55-5C, B-6 **[1] CHECK** reactor coolant system pressure to see if valve should be open **[1-PI-68-340A]**, **[1-PI-68-334]**, **[1-PI-68-323]**, **[1-PI-68-322]**. **[2] IF** PORV has spuriously opened **OR** Fails to reseat, **THEN** **CLOSE** associated block valve. **[3] IF** reactor trips, **THEN** **GO TO** E-0, *Reactor Trip or Safety Injection.* **[4] DETERMINE** which valve is open by performing the following: **[a] CHECK** power relief valve indicating lights. **[b] CHECK** safety and power relief valve line temperatures. **[c] CHECK** acoustic monitor (0-M-27A). **[5] IF** in Mode 4 or Mode 5 **AND** a LOCA is indicated, **THEN** **GO TO** AOP-R.02, Shutdown LOCA (MODE 4, or 5). **[6] IF** a small RCS leak is indicated, **THEN** **GO TO** AOP-R.05, RCS Leak and leak Source Identification.
Evaluator Note: The following steps are from **AOP-I.04.**		
	SRO	Direct performance of AOP-I.04 Section 2.1. "Uncontrolled RCS pressure drop due to open PORV in Modes 1-3"
CAUTION		**Partially open PORV may display no light indications.**
NOTE		Step 1 is an IMMEDIATE ACTION.
	RO	**CHECK** pzr PORVs CLOSED: • valve position indication • acoustic monitors. *(RNO if not previously performed)* **CLOSE** affected PORV and/or block valve as necessary to stop RCS pressure drop.

Op Test No.: NRC Scenario # 3 Event # 6 Page 16 of 62

Event Description: PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm

Time	Position	Applicant's Actions or Behavior
	RO	**MONITOR** RCS pressure STABLE or RISING.
	RO	**CHECK** SI signal NOT actuated.
		ENSURE available pzr heaters ENERGIZED as necessary.
CAUTION		**RCS pressure changes and changes in RCS boron concentration (due to differences between pzr and RCS boron) may impact core reactivity.**
	RO	**MONITOR** reactor power: a. **CHECK** reactor in Mode 1 or 2. b. **MONITOR** core thermal power for unexpected changes.
	SRO	**EVALUATE** EPIP-1, Emergency Plan Classification Matrix.
Evaluator Note: SRO may defer Tech Spec Evaluation at this time to implement AOP-R.05 for the Small RCS leak from the Safety Valve.		
	SRO	**EVALUATE** the following Tech Specs for applicability: • 3.2.5 DNB Parameters **Action may be applicable for a short time if RCS pressure drop to less than 2205 psig before the PORV is isolated.** • 3.4.3.2, PORVs **Action b applies and requires PORV restored or Block valve closed and Power removed within 1 hour.**
	CREW	**IF** PORV block valve must be closed **OR** power must be removed from block valve to comply with LCO 3.4.3.2, **THEN** **REFER TO** 0-SO-68-3, Pressurizer Pressure Control System. *(Section 8.3 contains instructions for removing power from Block Valve))*

Op Test No.: NRC Scenario # 3 Event # 6 Page 17 of 62

Event Description: PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK** the following NORMAL: • pressurizer pressure instruments • master pressure controller PIC-68-340.
	CREW	**ENSURE** WO initiated on failed equipment.
Evaluator Note: The following steps are from **AOP-R.05.**		
	SRO	Enter and direct actions of AOP-R.05.
Evaluator Note: SRO may defer Tech Spec Evaluation at this time to perform AOP-R.05.		
	SRO	**EVALUATE** the following Tech Spec/TRM LCOs for applicability: • 3.2.5, DNB parameters **Action may be applicable for if RCS pressure drop to less than 2205 psig.** • 3.4.3.1, Safety and Relief Valves-Operating **N/A Safety Valve is leaking but still operable.** • 3.4.3.2, Relief Valves-Operating **N/A for safety valve failure.** • 3.4.6.2, RCS Leakage **3.4.6.2 d. (>10 GPM Identified Leakage) requires Action b.** • TRM 3.4.11, Reactor Coolant System Head Vents **N/A** • 3.4.12, Low Temperature Over Pressure Protection Systems **N/A** • 3.6.1.4, Containment Pressure **N/A - leakage is contained in PRT** • 3.6.1.5, Containment Air Temperature **N/A - leakage is contained in PRT**

Op Test No.: NRC Scenario # 3 Event # 6 Page 18 of 62

Event Description: PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm

Time	Position	Applicant's Actions or Behavior
	SRO	**EVALUATE** EPIP-1, Emergency Plan Classification Matrix.
	CREW	**IF** leak results in radiological hazard or safety hazard, **THEN** **EVACUATE** unnecessary personnel from affected areas.
	SRO	**DIAGNOSE** the failure: *(Should Go To Section 2.1)*
	RO	**CONTROL** charging flow as necessary to maintain pressurizer level on program.
	RO	**MONITOR** pressurizer level: • greater than 10% • STABLE or RISING.
	RO	**CHECK** RHR shutdown cooling NOT in Service.
NOTE:	Appendix I or J may be used to estimate RCS leak rate.	
	RO	**MAINTAIN** VCT level greater than 13% **USING** automatic or manual makeup.
	RO	**MONITOR** containment pressure STABLE or DROPPING.
CAUTION:	**If Unit is in Mode 3 with low pressurizer pressure SI NOT blocked, SI should NOT be manually blocked to prevent safety injection.**	
	RO	**MONITOR** RCS pressure STABLE or RISING.
	BOP	**CHECK** secondary side radiation NORMAL: • S/G blowdown rad monitor • Condenser vacuum exhaust rad monitor • Main steam line rad monitors.

Op Test No.: NRC Scenario # 3 Event # 6 Page 19 of 62

Event Description: PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm

Time	Position	Applicant's Actions or Behavior
	BOP	**CHECK** containment airborne activity RISING. (RM-90-106 or 112)
NOTE	Containment purging and venting should NOT be resumed until Chemistry has evaluated off-site dose in a later step.	
	BOP	**ENSURE** containment purging and venting STOPPED: a. **CHECK** containment purging or venting in progress. b. **ENSURE** containment purge fans STOPPED. c. **ENSURE** containment purge dampers CLOSED.
	CREW	**DETERMINE** leakage source: a. **CHECK** leakage source UNKNOWN. *(RNO)* a. **IF** leakage source is known, **THEN** **PERFORM** the following: 1) **REFER TO** applicable substep in Step 10. 2) **IF** leakage source can be isolated, **THEN** **ISOLATE** leakage source. 3) **GO TO** Step 11. d. **CHECK** pressurizer safety valves NORMAL: • Tailpipe temperature • Acoustic monitors *(RNO next Page)*

Op Test No.: NRC Scenario # 3 Event # 6 Page 20 of 62

Event Description: PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm

Time	Position	Applicant's Actions or Behavior
	CREW	d. **PERFORM** the following: 1) **CHECK** pzr enclosure temperature (ICS point T1001A). 2) **REFER TO** 0-SO-30-5, Lower Compartment Cooling Units. 3) **CONSULT** Systems Engineering for recommendations. e. **CHECK** PRT conditions NORMAL: • Level • Pressure • Temperature *(RNO)* e. **ENSURE** head vent valves CLOSED: • FSV-68-394 • FSV-68-395 • FSV-68-396 • FSV-68-397 **CONSULT** Systems Engineering regarding other potential leak paths to PRT: • ECCS relief valves • RHR relief valves • CVCS relief valves. **MAINTAIN** PRT parameters **USING** 1,2-SO-68-5, Pzr Relief Tank. *(Crew may elect to vent PRT during scenario to keep pressure within normal range)*
	BOP	11. **MONITOR** auxiliary building radiation and HELB recorders NORMAL.

Op Test No.: NRC	Scenario # 3	Event # 6	Page 21 of 62
Event Description:	PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm		

Time	Position	Applicant's Actions or Behavior
	CREW	**CHECK** leak IDENTIFIED and ISOLATED. *(RNO)* **PERFORM** the following: a. **IF** additional cooling is required to control containment temperature, **THEN** **PERFORM** Appendix H, Additional Containment Cooling. *(Action may not be required at this time)* b. **IF** pressurizer level greater than 20%, **THEN** **PERFORM** the following: 1) **RESTORE** CVCS charging and letdown **USING** EA-62-5, Establishing Normal Charging and Letdown. 2) **ENSURE** pressurizer heaters in service as required. *(EA-62-5 N/A)* c. **IF** RHR is in service **AND** FCV-62-83 closed in Step 10.b., **THEN** **OPEN** FCV-62-83 to restore RHR letdown. d. **ATTEMPT** to estimate RCS leak rate **USING** one of the following: • Appendix I (recommended if leak requires in significant increase in charging flow) • Appendix J (requires NO VCT makeup, dilution, or boration flow) *(Step RNO Continued next Page)*

Op Test No.: NRC	Scenario # 3	Event # 6	Page 22 of 62
Event Description:	PORV Fail 50% Open & Pressurize Safety Valve Leak ~13 gpm		

Time	Position	Applicant's Actions or Behavior
	CREW	e. **IF** conditions permit, **THEN** **DETERMINE** RCS leak rate **USING** 0-SI-OPS-068-137.0, Reactor Coolant System Water Inventory.
	CREW	f. **IF** leak rate exceeds Tech Spec limit **AND** leak CANNOT be isolated, **THEN** **INITIATE** plant shutdown **USING** one of the following: • AOP-C.03, Rapid Shutdown or Load Reduction **OR** • 0-GO-5 Normal Power Operation.
Evaluator Note:	Leak exceeds 10 gpm Tech Spec Limit therefore, Shutdown should be initiated. AOP-R.05 may be discontinued at this point and shutdown initiated. See Next Event Guide.	

Op Test No.: NRC	Scenario # 3	Event # 7	Page 23 of 62
Event Description:	Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03		

Time	Position	Applicant's Actions or Behavior
Console Operator: No action required for this event.		
Indications Available: N/A Directed by procedure.		
Evaluator Note: Crew may decide to shutdown using 0-GO-5 rather than AOP-C.03. If this is the case, a prompt from Operations Management should be provided that rapid shutdown should be performed using AOP-C.03.		
	SRO	Enter and direct performance of AOP-C.03.
	SRO	**ENSURE** crew has been briefed on reactivity management expectations **USING** Appendix E.
	CREW	**NOTIFY** following personnel of rapid shutdown or load reduction: • Load Coordinator **[C.1]** • Chemistry • RADCON • Plant Management
	BOP/RO	**MONITOR** reactor/turbine trip NOT required **USING** Appendix A, Reactor and Turbine Trip Criteria.
	BOP	**CHECK** VALVE POSITION LIMIT light DARK on EHC panel. [M-2]
NOTE:	BAT is preferred boration source. Boration volume and flowrates in the following step are recommendations and may be adjusted as necessary.	

Op Test No.: NRC Scenario # 3 Event # 7 Page 24 of 62

Event Description: Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03

Time	Position	Applicant's Actions or Behavior
	SRO/RO	**IF** borating from BAT, **THEN** **PERFORM** the following: a. **DETERMINE** recommended boration volume: • ~800 gal to reduce power from 100% to 20% **OR** • 10 gal for each 1% power reduction *(Due to previous runback, power is not at 100%, Boration volume may be around 500-600 gal for reduction from ~80% to 20% at 10 gal/%)* b. **DETERMINE** recommended boration flowrate and volume from table below:

TURBINE LOAD REDUCTION RATE (%/min)	BORATION FLOWRATE
1%	~15 gpm
2%	~30 gpm
3%	~45 gpm
4%	~70 gpm

c. **PLACE** boric acid transfer pump aligned to blender in FAST speed.

d. **ADJUST** FCV-62-138 to establish desired flow rate.

e. **CONTROL** boration flow as required to inject desired boric acid volume.

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Event Description: Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03

Time	Position	Applicant's Actions or Behavior
	BOP	**INITIATE** load reduction as follows: a. **ADJUST** load rate to desired value: • between 1% and 4% per minute if borating via FCV-62-138 b. **ADJUST** setter for desired power level:

DESIRED RX POWER LEVEL	RECOMMENDED SETTER VALUE
90%	76
80%	56
70%	46
60%	40
50%	35
40%	30
30%	25
20% or less	15

c. **INITIATE** turbine load reduction by depressing GO pushbutton.

d. **CONTROL** turbine load reduction as necessary to reduce power to desired level.

Op Test No.: NRC	Scenario # 3	Event # 7	Page 26 of 62
Event Description:	Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03		

Time	Position	Applicant's Actions or Behavior
	RO	**MONITOR** T-avg/T-ref mismatch: a. **CHECK** T-ref indication AVAILABLE. b. **MONITOR** automatic rod control maintaining T-avg/T-ref mismatch less than 3°F. (*Automatic Rod control not available due to earlier failure RNO Required)* **IF** any of the following conditions met: • auto rod control NOT functional **OR** • turbine load rate adjustment is NOT effective in reducing mismatch **OR** • situation does NOT allow slowing down load reduction, **THEN** **RESTORE** T-avg to within 3°F of T-ref **USING** manual rod control as necessary. **IF** T-avg/T-ref mismatch CANNOT be maintained less than 5°F, **THEN** **TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection.

Op Test No.:	NRC	Scenario #	3	Event #	7	Page	27	of 62
Event Description:	Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03							

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** automatic control of MFW pump speed AVAILABLE. *(Automatic MFP Speed Not available due to earlier failure. RNO Required)* **PERFORM** the following: a. **CONTROL** speed of affected MFWP(s) **USING** one of the following: • MFWP pump speed controller in MANUAL **OR** • MFWP Governor Valve Positioner **USING** 1,2-SO-2/3-1. b. **MAINTAIN** the following: • MFW pump D/P approximately on program **USING** Appendix F • MFW pump A and B speed/flow approximately matched.
	BOP	**STOP** secondary plant equipment **USING** Appendix B, Secondary Plant Equipment.
Evaluator Note: Appendix B is included near the end of this Event guide on Page 45)		
	RO	**MONITOR** control rods above low-low insertion limit **USING** ICS or COLR.
NOTE:	Initiating plant shutdown required by Tech Specs requires 4 hour NRC notification per SPP-3.5, Regulatory Reporting Requirements.	
	SRO	**EVALUATE** Tech Specs/TRM for applicability: • 3.2.1, Axial Flux Difference • 3.1.1.1, Shutdown Margin • 3.1.3.6, Rod Insertion Limits • TRM 3.1.2.2, Boration Flowpaths

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Event Description: Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03

Time	Position	Applicant's Actions or Behavior
	SRO	**EVALUATE** EPIP-1, Emergency Plan Initiating Conditions Matrix.
	RO	**ENSURE** one set of backup heaters energized to reduce boron concentration difference between pzr and RCS loops.
	CREW	**WHEN** reactor power change exceeds 15% within one hour, **THEN** **NOTIFY** Chemistry to initiate sampling as required by 0-SI-CEM-000-050.0, 0-SI-CEM-030-407.2 and 0-SI-CEM-030-415.0.
	SRO	**MONITOR** if turbine load reduction can be stopped: a. **CHECK** the following conditions met: • turbine or reactor shutdown NOT needed. • turbine load at desired power level (further load reduction NOT needed) *(RNO)* a. **IF** turbine or reactor shutdown is needed, **THEN** **GO TO** Step 17.
	SRO	17. **CHECK** Reactor Shutdown required.
CAUTION:		**When tripping Reactor at low power levels, AFW flow must be reduced promptly (when permitted by ES-0.1) to prevent excessive RCS cooldown.**
NOTE:		The following ESF actuations are expected to occur as a result of removing the unit from service: • manual reactor trip • Feedwater Isolation • Auxiliary Feedwater start

Op Test No.:	NRC	Scenario #	3	Event #	7	Page	29	of 62
Event Description:	Rapid Plant Shutdown Due to Small RCS Leak Using AOP-C.03							

Time	Position	Applicant's Actions or Behavior
	CREW	**WHEN** reactor power is approximately 20% or less **AND** reactor shutdown is needed, **THEN** **PERFORM** the following: a. **IF** boration is not needed, **THEN** **ENSURE** boration flow STOPPED. b. **DEPRESS** RESET on MSR Control Panel XX-47-3000. c. **CHECK** all MSR TCVs **CLOSED.** d. **TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection.
When sufficient load reduction has been completed, lead examiner may cue the next event.		

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 30 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 8		
Indications available: • Safety Valve Acoustic Monitor indication Maximum (XX-68-363A on M-4) • Pressurizer Pressure decreasing		
	SRO	Direct Manual Rx Trip and Safety Injection.
	SRO	Enter and Direct Actions of E-0
Evaluator Note:		Crew may Trip RCPs based on E-0 foldout page at any time during performance of E-0 when RCP Trip Criteria are met. If not addressed based on foldout page, RCPs should be stopped at step 8 of E-0. (CRITICAL TASK 1) Crew may manually initiate Phase A Containment Isolation during performance of E-0 as prudent action. If not initiated as prudent action, it will be initiated during performance of ES-0.5. (CRIITICAL TASK 2).
NOTE 1: Steps 1 through 4 are immediate action steps. **NOTE 2:** This procedure has a foldout page.		
	RO	**VERIFY** reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps. • Neutron flux DROPPING
	BOP	**VERIFY** turbine TRIPPED: • Turbine stop valves CLOSED.

Op Test No.: NRC Scenario # 3 Event # 8, 9, 10, & 11 Page 31 of 62

Event Description: Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** at least one train of shutdown boards ENERGIZED.
	RO	**DETERMINE** if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D]. RAS ~~(RHR Pump 1B will not be tripped)~~ NO RHR pumps AVAILABLE RSB
	BOP	**PERFORM** ES-0.5, Equipment Verifications WHILE continuing in this procedure. *(ES-0.5 at end of Scenario See Page 58)*
	BOP	**DETERMINE** if secondary heat sink available: a. **CHECK** total AFW flow greater than 440 gpm. b. **CHECK** narrow range level greater than 10% [25% ADV] in at least one S/G. c. **CONTROL** feed flow to maintain narrow range level between 10% [25% ADV] and 50% in intact or ruptured S/Gs.

Op Test No.: NRC Scenario # 3 Event # 8, 9, 10, & 11 Page 32 of 62

Event Description: Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails

Time	Position	Applicant's Actions or Behavior
	BOP/RO	**CHECK** if main steam lines should be isolated: a. **CHECK** if any of the following conditions have occurred: • Any S/G pressure less than 600 psig. **OR** • Any S/G pressure dropping UNCONTROLLED. **OR** • Phase B actuation. b. **ENSURE** MSIVs and MSIV bypass valves CLOSED. c. **ENSURE** applicable Foldout Page actions COMPLETED.
Critical Task 1	RO	**CHECK** RCP trip criteria: a. **CHECK** the following: • RCS pressure less than 1250 psig **AND** • At least one CCP **OR** SI pump RUNNING. b. **STOP** RCPs. *(Critical Task - Trip RCPs based 1250 psi RCP Trip criteria Prior to Exiting E-0)*

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 33 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
	RO/BOP	**MONITOR** RCS temperatures: • **IF** any RCP running, **THEN** **CHECK** T-avg stable at or trending to between 547°F and 552°F. **OR** • **IF** RCPs stopped, **THEN** **CHECK** T-cold stable at or trending to between 547°F and 552°F. *(If No Perform RNO)* **IF** temperature less than 547°F and dropping, **THEN** **PERFORM** the following: a. **ENSURE** steam dumps and atmospheric reliefs CLOSED. b. **IF** cooldown continues, **THEN** **CONTROL** total feed flow: 1) **ENSURE** total AFW flow less than or equal to 600 gpm. 2) **MAINTAIN** total AFW flow greater than 440 gpm UNTIL narrow range level is greater than 10% [25% ADV] in at least one S/G.

Op Test No.: NRC Scenario # 3 Event # 8, 9, 10, & 11 Page 34 of 62

Event Description: Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK pressurizer PORVs, safeties, and spray valves:** a. **Pressurizer PORVs CLOSED.** b. **Pressurizer safety valves CLOSED.** *(RNO Required)* b. **IF** pressurizer pressure is less than 2485 psig, **THEN** **PERFORM** the following: 1) **MONITOR** status trees. 2) **GO TO** E-1, Loss of Reactor or Secondary Coolant. *(Transition to E-1)*

Evaluator Note: The primary procedure flowpath at this point should be E-1 to ECA-1.1 at step 15 of E-1. The Event Guide for this path follows.

Upon transition to E-1, Status Tree monitoring is in effect therefore, during the performance of E-1, crew may transition to FR-Z.1 based on containment pressure >2.8 psi. *An event guide for the applicable portions of **FR-Z.1 begins on page Page 50.***

Also, During performance of E-1, ECA-1.1, or FR-Z.1, sump swapover conditions may occur (RWST <27%). The crew should transition to ES-1.3. *An event guide for the applicable portions of **ES-1.3 begins on Page 56**.* If ES-1.3 is implemented, the crew should transition to ECA-1.1 at step 5.

Whenever ECA-1.1 is entered, it allows for concurrent performance of FR-Z.1 with ECA-1.1 if required.

Evaluator Note: When Phase B occurs during E-0 or E-1, 1B-B Containment spray pump will fail to Auto start and will not manually start. When the pump fails to start, crew should attempt to manually start it. This failure requires no other specific action other than dispatching personnel to determine the problem as time allows. This failure may be addressed during performance of ES-0.5.

Op Test No.:	NRC	Scenario #	3	Event #	8, 9, 10, & 11	Page	35	of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails							

Time	Position	Applicant's Actions or Behavior
	SRO	Enter and Direct Actions of E-1.
NOTE		This procedure has a foldout page.
	SRO	**CHECK** RCP trip criteria: *(RCPs should already be stopped)*
	RO/BOP	**MONITOR** if hydrogen igniters and recombiners should be turned on: a. **CHECK** containment conditions NOT normal: • containment pressure high **OR** • containment sump level high. b. **DISPATCH** personnel to open ice condenser AHU breakers **USING** EA-201-1, 480 V Board Room Breaker Alignments. c. **CHECK** hydrogen concentration measurement AVAILABLE: • Hydrogen analyzers have been in ANALYZE for at least 5 minutes. *(RNO next page)*

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 36 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
		c. **PERFORM** the following: 1) **DISPATCH** operator to place hydrogen analyzers in service **USING** Appendix D (also contained in ES-0.5). *(Following steps are from Appendix D if needed)* **PLACE** hydrogen analyzers in service: a. **ENSURE** the following switches in ANALYZE position: [M-10] • HS-43-200A, Cntmt H2 Analyzer Fan A • HS-43-210A, Cntmt H2 Analyzer Fan B. b. **RECORD** time: _____ c. **NOTIFY** Unit Supervisor of time that hydrogen analyzers were placed in ANALYZE. **NOTE** The following step is performed when directed by an EOP step (after hydrogen concentration has been verified and ice condenser AHU breakers have been opened). **WHEN** directed to energize hydrogen igniters, **THEN** **ENSURE** the following switches in ON position: [M-10] • HS-268-73, H2 Igniters Group A • HS-268-74, H2 Igniters Group B.

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 37 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
	BOP	2) **WHEN** hydrogen analyzers have been in ANALYZE for at least 5 minutes, **THEN** **PERFORM** substeps 2.d through 2.f. d. **CHECK** containment hydrogen concentration less than 6%. e. **WHEN** ice condenser AHU breakers have been opened, **THEN** **ENERGIZE** hydrogen igniters **USING** Appendix D. f. **CHECK** containment hydrogen concentration less than 0.5%. [M-10]
	BOP	**CHECK** S/G secondary pressure boundaries INTACT: • S/G pressures CONTROLLED or RISING • S/G pressures greater than 140 psig.
	BOP	**MAINTAIN** Intact S/G narrow range levels: a. Greater than 10% [25% ADV]. b. Between 10% [25% ADV] and 50%.

Op Test No.: NRC Scenario # 3 Event # 8, 9, 10, & 11 Page 38 of 62

Event Description: Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** secondary radiation NORMAL: a. **CHECK** secondary radiation NORMAL **USING** Appendix A, Secondary Rad Monitors. b. **NOTIFY** Chem Lab to take S/G activity samples. c. **WHEN** Chem Lab is ready to sample S/Gs, **THEN** **PERFORM** the following: 1) **ENSURE** FCV-15-43 Blowdown Flow Control valve CLOSED. 2) **ENSURE** Phase A RESET. 3) **OPEN** blowdown isolation valves. d. **NOTIFY** RADCON to survey main steam lines and S/G blowdown. e. **WHEN** S/G samples completed, **THEN** **CLOSE** blowdown isolation valves.
CAUTION		**Any time a pressurizer PORV opens, there is a possibility that it may stick open.**
	RO	**MONITOR** pressurizer PORVs and block valves: a. Power to block valves AVAILABLE. b. Pressurizer PORVs CLOSED. c. At least one block valve OPEN. *(NOTE: One PORV will indicate open with it's block valve closed due to the earlier failure)*

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 39 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
	RO/BOP	**MONITOR** SI termination criteria: a. RCS subcooling based on core exit T/Cs greater than 40°F. *(Based on crew specific timing criteria may or may not be met)* *(RNO if required)* a. **GO TO** Step 8. b. Secondary heat sink: • Narrow range level in at least one Intact S/G greater than 10% [25% ADV]. **OR** • Total feed flow to Intact S/Gs greater than 440 gpm. c. RCS pressure STABLE or RISING. *(Pressure should still be decreasing slowly RNO required)* c. **GO TO** Step 8. *(Sub steps d. and e. included for information only)* d. Pressurizer level greater than 10% [20% ADV]. e. **GO TO** ES-1.1, SI Termination.
	RO	8. **MONITOR** if containment spray should be stopped: a. **CHECK** any containment spray pump RUNNING. b. **CHECK** containment pressure less than 2.0 psig. *(RNO)* b. **GO TO** Step 9.

Op Test No.: NRC Scenario # 3 Event # 8, 9, 10, & 11 Page 40 of 62

Event Description: Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails

Time	Position	Applicant's Actions or Behavior
	RO	9. **MONITOR** if containment vacuum control should be returned to normal: a. **CHECK** containment pressure less than 1.0 psig. *(RNO)* a. **GO TO** Step 10.
	BOP	10. **MONITOR** shutdown boards continuously energized.
	RO/BOP	**DETERMINE** if RHR pumps should be stopped: a. **CHECK** RCS pressure: 1) Greater than 300 psig 2) STABLE or RISING. *(RNO)* 2) **ENSURE** CCS ALIGNED to RHR heat exchanger: • FCV-70-156 OPEN • FCV-70-153 OPEN. **GO TO** Step 12.
NOTE 1		S/G pressures dropping slowly during a LOCA with no faulted S/G should be considered "stable" in the following step.
NOTE 2		RCS pressure rising slightly during a LOCA which is NOT isolated should be considered "stable" in the following step.
	RO/BOP	12. **DETERMINE** if SI termination criteria should be checked again: a. **CHECK** pressure in all S/Gs STABLE or RISING. b. **CHECK** RCS pressure STABLE or DROPPING.

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 41 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
	RO	**MONITOR** if RHR spray should be placed in service: a. **CHECK** the following conditions met: • Containment pressure greater than 9.5 psig **AND** • At least 1 hour has elapsed since beginning of accident *(RNO)* a. **WHEN** conditions in Substep 13.a are met, **THEN** **PERFORM** Substeps 13.b through 13.d. **GO TO** Step 14.
	BOP	**DETERMINE** if diesel generators should be stopped: a. **VERIFY** shutdown boards ENERGIZED from start busses. b. **ENSURE** SI signal RESET. c. **STOP** any unloaded diesel generators and **PLACE** in standby **USING** EA-82-1, Placing D/Gs in Standby.

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 42 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
	RO	**INITIATE** evaluation of plant status: a. **ENSURE** cold leg recirculation capability: 1) Power to at least one RHR pump AVAILABLE. 2) Capability to operate the following valves AVAILABLE: • FCV-63-72 and FCV-74-3 (for RHR Pump A-A). **OR** • FCV-63-73 and FCV-74-21 (for RHR Pump B-B). *(RNO)* a. **IF** NO train of cold leg recirculation capability is available, **THEN** **GO TO** ECA-1.1, Loss of RHR Sump Recirculation.
	SRO	Enter and direct actions of ECA-1.1
CAUTION		**Continued ECCS or spray pump operation following loss of suction source will result in pump damage.**
NOTE		If an orange path exists on containment status tree, FR-Z.1 may be performed concurrently with this procedure.
	RO	**MONITOR** for containment sump blockage: a. **CHECK** at least one train of ECCS aligned for sump recirculation. *(RNO)* a. **GO TO** Step 2.

Op Test No.: NRC	Scenario # 3	Event # 8, 9, 10, & 11	Page 43 of 62
Event Description:	Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails		

Time	Position	Applicant's Actions or Behavior
	RO	**MONITOR** sump recirculation capability: • **WHEN** sump recirculation capability restored, **THEN** **RETURN TO** procedure and step in effect.
	RO	**CHECK** RHR sump recirculation equipment AVAILABLE: • Power to RHR pumps AVAILABLE • RHR pumps OPERABLE • Containment sump valves FCV-63-72 and FCV-63-73 OPERABLE. *(RNO)* **ATTEMPT** to restore at least one train.
	BOP	**MONITOR** shutdown boards continuously energized.
	RO	**RESET** SI and **CHECK** the following: • AUTO S.I. BLOCKED permissive LIT [M-4A, C4] • S.I. ACTUATED permissive DARK [M-4A, D4].
	RO	**RESET** SIS RWST-CNTMT SUMP SWITCHOVER RESET switches: • HS-63-72D • HS-63-73D.
	RO	**MONITOR** RWST level greater than 8%.

Op Test No.: NRC Scenario # 3 Event # 8, 9, 10, & 11 Page 44 of 62

Event Description: Przr SV Fails 100%, 1B RHR Trips, Both Trn Ph A Isol Fail, 1B Cntmnt Spray Fails

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 3	RO	**DETERMINE** containment spray requirements: a. **CHECK** containment spray pump suction ALIGNED to RWST. b. **DETERMINE** number of spray pumps required from table below:

RWST LEVEL (%)	CONTAINMENT PRESSURE (PSIG)	NUMBER OF CONTAINMENT SPRAY PUMPS REQUIRED
Greater than 8	Greater than 12.0	2
	Between 9.5 and 12.0	1
	Less than 9.5	0
Less than 8	-------	0

	RO	c. **CHECK** number of spray pumps running equal to number required. *(RNO – Required # of Spray pumps should be 0. Running spray pump 1A-A should be stopped)* c. **START** or **STOP** containment spray pumps to establish required number of running pumps. *(Critical Task: Stop Containment Spray Pumps prior to initiating RCS cooldown in ECA-1.1)*

Lead Examiner may Terminate Scenario When Running Containment Spray Pump is shutdown in the preceding ECA-1.1 step.

Op Test No.: NRC	Scenario # 3	Event # C.03, App B	Page 45 of 62
Event Description:	AOP-C.03 Appendix B For Stopping Secondary Plant Equipment		

Time	Position	Applicant's Actions or Behavior

Evaluator Note: All Steps of this Appendix would typically be performed by the **BOP** Operator

APPENDIX B

SECONDARY PLANT EQUIPMENT

[1] **ENSURE** plant announcement(s) made on the following:

- starting rapid shutdown (or load reduction) due to (reason)
- stopping secondary plant equipment

[2] **WHEN** turbine impulse pressure is approximately 80% or less, **THEN**

PERFORM the following:

[a] ENSURE one Cond Demin Booster Pump STOPPED.

[b] ENSURE associated suction valve CLOSED:

COND DEMIN BOOSTER PUMP	SUCTION VALVE	CLOSED √
A	FCV-2-290	☐

OR

B	FCV-2-285	☐

OR

C	FCV-2-280	☐

Op Test No.: NRC	Scenario # 3	Event # C.03, App B	Page 46 of 62
Event Description: AOP-C.03 Appendix B For Stopping Secondary Plant Equipment			
Time	Position	Applicant's Actions or Behavior	

[3] **WHEN** turbine impulse pressure is approximately 70-75%,
THEN

PERFORM the following:

[a] ENSURE one Condensate Booster Pump STOPPED.

[b] ENSURE associated CBP suction valve CLOSED:

CONDENSATE BOOSTER PUMP	SUCTION VALVE	CLOSED √
A	FCV-2-94	☐
OR		
B	FCV-2-87	☐
OR		
C	FCV-2-81	☐

[c] PERFORM 1,2-SO-2/3-1 Section 7.2 to adjust seal injection water pressure on stopped CBP to prevent water intrusion in oil. (may be assigned to another operator or delayed if necessary)

Op Test No.: NRC	Scenario # 3	Event # C.03, App B	Page 47 of 62
Event Description: AOP-C.03 Appendix B For Stopping Secondary Plant Equipment			

Time	Position	Applicant's Actions or Behavior

[4] **WHEN** turbine impulse pressure is approximately 65% or less, **THEN**

PERFORM the following:

[a] STOP remaining two Cond Demin Booster Pumps simultaneously.

[b] ENSURE suction valves CLOSED:

COND DEMIN BOOSTER PUMP	SUCTION VALVE	CLOSED √
A	FCV-2-290	☐
B	FCV-2-285	☐
C	FCV-2-280	☐

[c] STOP one No. 3 Heater Drain pump.

[d] STOP one No. 7 Heater Drain pump.

Op Test No.: NRC	Scenario # 3	Event # C.03, App B	Page 48 of 62
Event Description: AOP-C.03 Appendix B For Stopping Secondary Plant Equipment			

Time	Position	Applicant's Actions or Behavior

[5] **WHEN** turbine impulse pressure is approximately 45% or less,
THEN
PERFORM the following:

[a] **IF** desired to remove one MFW pump from service,
THEN
PERFORM the following:

1. **THROTTLE OPEN** recirc valve in MANUAL (30-50% OPEN) for MFWP to be removed from service.
2. **PLACE** speed controller in MANUAL for MFWP to be removed from service.
3. **REDUCE** speed gradually on MFWP to be removed from service.
4. **ENSURE** proper loading on remaining MFWP.
5. **WHEN** MFWP is unloaded,
   THEN
   TRIP affected MFWP.
6. **CLOSE** recirc valve for MFWP removed from service.

[b] **STOP** remaining No. 7 Heater Drain pump.

[c] **CLOSE** isolation valves from #7 Heater Drain Pumps to heater strings:

VALVE	DESCRIPTION	CLOSED √
FCV-6-143	Htr Drain Tk Pump 7 to Htr String A	☐
FCV-6-163	Htr Drain Tk Pump 7 to Htr String B	☐
FCV-6-184	Htr Drain Tk Pump 7 to Htr String C	☐

Op Test No.: NRC	Scenario # 3	Event # C.03, App B	Page 49 of 62
Event Description: AOP-C.03 Appendix B For Stopping Secondary Plant Equipment			

Time	Position	Applicant's Actions or Behavior

[6] **WHEN** turbine impulse pressure is approximately 30% or less,
THEN
PERFORM the following:

[a] ENSURE main turbine EHC controls in IMP OUT.

[b] STOP remaining No. 3 Heater Drain pumps.

[c] CLOSE isolation valves from #3 Htr Drain Pumps to heater strings:

VALVE	DESCRIPTION	CLOSED √
FCV-6-108	Htr Drain Tk Pump 3 to Htr String A	☐
FCV-6-109	Htr Drain Tk Pump 3 to Htr String B	☐
FCV-6-110	Htr Drain Tk Pump 3 to Htr String C	☐

[d] STOP one of two remaining Condensate Booster Pumps.

[e] ENSURE associated CBP suction valve CLOSED:

CONDENSATE BOOSTER PUMP	SUCTION VALVE	CLOSED √
A	FCV-2-94	☐
OR		
B	FCV-2-87	☐
OR		
C	FCV-2-81	☐

[f] STOP one of three Hotwell Pumps.

[g] PERFORM 1,2-SO-2/3-1 Sect. 7.2 to adjust seal injection water pressure on stopped CBP to prevent water intrusion in oil.

Op Test No.: NRC	Scenario # 3	Event # FR-Z.1	Page 50 of 62
Event Description: High Containment Pressure			

Time	Position	Applicant's Actions or Behavior
		FR-Z.1 Actions
NOTE		If this procedure has been entered for an orange path and performance of ECA-1.1 (Loss of RHR Sump Recirculation) is required, FR-Z.1 may be performed concurrently with ECA-1.1.
	RO	**MONITOR** RWST level greater than 27%.
	RO	**VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN • Panel 6L PHASE B GREEN.
	RO	**ENSURE** RCPs STOPPED.
	BOP	**DETERMINE** if this procedure should be exited: a. **CHECK** for faulted S/G: • Any S/G pressure DROPPING in an uncontrolled manner **OR** • Any S/G pressure less than 140 psig. *(RNO)* a. **GO TO** Step 5.

Op Test No.: NRC	Scenario # 3	Event # FR-Z.1	Page 51 of 62
Event Description: High Containment Pressure			

Time	Position	Applicant's Actions or Behavior
	RO	**VERIFY** containment spray operation: a. **CHECK** RHR sump recirculation capability AVAILABLE. *(RNO)* a. **IF** ECA-1.1, Loss of RHR Sump Recirculation, is IN EFFECT, **THEN** **PERFORM** the following: 1) **OPERATE** containment spray as directed by ECA-1.1. 2) **GO TO** Step 6. *(Continue if ECA-1.1 not in Effect other wise go to step 6)* b. **VERIFY** containment spray pumps RUNNING. *(NOTE: Only one Containment Spray Pump will be running)* c. **CHECK** RWST level greater than 27%. d. **VERIFY** containment spray suction ALIGNED to RWST: • FCV-72-22 OPEN • FCV-72-21 OPEN. e. **VERIFY** containment spray discharge valves OPEN: • FCV-72-39 • FCV-72-2. f. **VERIFY** containment spray recirc valves CLOSED: • FCV-72-34 • FCV-72-13 g. **VERIFY** containment spray flow greater than 4750 gpm on each train.

Op Test No.: NRC Scenario # 3 Event # FR-Z.1 Page 52 of 62

Event Description: High Containment Pressure

Time	Position	Applicant's Actions or Behavior
	RO	6. **MONITOR** containment air return fans: • **WHEN** at least 10 minutes have elapsed from Phase B, **THEN** **ENSURE** containment air return fans RUNNING.
	RO	**VERIFY** containment ventilation dampers CLOSED: • Panel 6K CNTMT VENT GREEN • Panel 6L CNTMT VENT GREEN.
	RO	**VERIFY** Phase A valves CLOSED: • Panel 6K PHASE A GREEN • Panel 6L PHASE A GREEN. *(Phase A Failures should be previously addressed at this point)*
	RO	**VERIFY** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48.
	RO	**VERIFY** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48.
	BOP	**VERIFY** MSIVs and MSIV bypass valves CLOSED.

Op Test No.: NRC Scenario # 3 Event # FR-Z.1 Page 53 of 62

Event Description: High Containment Pressure

Time	Position	Applicant's Actions or Behavior
	BOP	**DETERMINE** if any S/G Intact: a. **CHECK** at least one S/G pressure: • CONTROLLED or RISING **AND** • Greater than 140 psig.
CAUTION	**Isolating all S/Gs will result in a loss of secondary heat sink.**	
	BOP	**DETERMINE** if any S/G Faulted: • Any S/G pressure DROPPING in an uncontrolled manner **OR** • Any S/G pressure less than 140 psig. *(RNO)* a. **GO TO** Step 13.

Op Test No.: NRC Scenario # 3 Event # FR-Z.1 Page 54 of 62

Event Description: High Containment Pressure

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** if hydrogen igniters and recombiners should be turned on: a. **DISPATCH** personnel to open ice condenser AHU breakers **USING** EA-201-1, 480 V Board Room Breaker Alignments. b. **CHECK** hydrogen concentration measurement AVAILABLE: • Hydrogen analyzers have been in ANALYZE for at least 5 minutes. *(RNO as required)* b. **PERFORM** the following: 1) **DISPATCH** operator to place hydrogen analyzers in service **USING** Appendix D. (also contained in ES-0.5) 2) **WHEN** hydrogen analyzers have been in ANALYZE for at least 5 minutes, **THEN** **PERFORM** substeps 13.c through 13.e. 3) **GO TO** Step 14. *(Steps c. thru e. as required)* c. **CHECK** containment hydrogen concentration less than 6%. d. **WHEN** ice condenser AHU breakers have been opened, **THEN** **ENERGIZE** hydrogen igniters **USING** Appendix D, Placing Hydrogen Analyzers and Igniters In Service. e. **CHECK** containment hydrogen concentration less than 0.5%.

Op Test No.: NRC Scenario # 3 Event # FR-Z.1 Page 55 of 62

Event Description: High Containment Pressure

Time	Position	Applicant's Actions or Behavior
	RO	14. **MONITOR** if RHR spray should be placed in service: a. **CHECK** the following: • Containment pressure greater than 9.5 psig **AND** • At least 1 hour has elapsed since beginning of accident a. **GO TO** Step 15.
	RO	15. **MONITOR** if containment spray should be stopped: a. **CHECK** any containment spray pump RUNNING. b. **CHECK** containment pressure less than 2.0 psig. *(RNO)* b. **GO TO** Step 16.
	SRO	16. **RETURN TO** procedure and step in effect.

Op Test No.:	NRC	Scenario #	3	Event #	ES-1.3	Page	56	of 62
Event Description:	Transfer To RHR Containment Sump							

Time	Position	Applicant's Actions or Behavior
		ES-1.3 Actions
CAUTION		**Transfer to sump recirculation may cause high radiation in Aux Building.**
	RO	**MONITOR** RHR automatic switchover: a. **CHECK** containment sump level greater than 11%. b. **CHECK** containment sump valves FCV-63-72 and FCV-63-73 OPEN. c. **CHECK** RHR suction valves FCV-74-3 and FCV-74-21 CLOSING.
	RO	**DETERMINE** if containment spray should be stopped: a. **CHECK** any containment spray pump RUNNING. b. **CHECK** containment pressure greater than or equal to 2.0 psig. c. **CHECK** BOTH cntmt spray pumps RUNNING. *(RNO)* c. **GO TO** Step 4.
	RO	**MONITOR** RWST supply to ECCS pumps: • RWST LVL LO-LO alarm DARK [M-6E, E4]. • RWST level greater than 8%.

Op Test No.: NRC	Scenario # 3	Event # ES-1.3	Page 57 of 62
Event Description: Transfer To RHR Containment Sump			

Time	Position	Applicant's Actions or Behavior
	RO/SRO	**MONITOR** RHR pumps RUNNING. *(RNO)* **IF** NO RHR pump running **AND** CCPs or SI pumps have lost suction, **THEN** **STOP** affected CCPs and SI pumps. **START** RHR pumps. **IF** NO RHR pump can be started, **THEN** **PERFORM** the following: a. **RESUME** FRP implementation. b. **GO TO** ECA-1.1, Loss of RHR Sump Recirculation.

Op Test No.: NRC Scenario # 3 Event # ES-0.5 Page 58 of 62

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5 Actions
		VERIFY D/G ERCW supply valves OPEN.
	BOP	**VERIFY** at least four ERCW pumps RUNNING.
	BOP	**VERIFY** CCS pumps RUNNING: • Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	**VERIFY** EGTS fans RUNNING.
	BOP	**VERIFY** generator breakers OPEN.
	BOP	**VERIFY** AFW pumps RUNNING: • MD AFW pumps • TD AFW pump.
		NOTE AFW level control valves should NOT be repositioned if manual action has been taken to control S/G levels, to establish flow due to failure, or to isolate a faulted S/G.
	BOP	**CHECK** AFW valve alignment: a. **VERIFY** MD AFW LCVs in AUTO. b. **VERIFY** TD AFW LCVs OPEN. c. **VERIFY** MD AFW pump recirculation valves FCV-3-400 and FCV-3-401 CLOSED.

Op Test No.: NRC Scenario # 3 Event # ES-0.5 Page 59 of 62

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** MFW Isolation: • MFW pumps TRIPPED • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	**MONITOR** ECCS operation: **VERIFY** ECCS pumps RUNNING: • CCPs • RHR pumps • SI pumps **VERIFY** CCP flow through CCPIT. **CHECK** RCS pressure less than 1500 psig. **VERIFY** SI pump flow. **CHECK** RCS pressure less than 300 psig. **VERIFY** RHR pump flow.

Op Test No.: NRC	Scenario # 3	Event # ES-0.5	Page 60 of 62
Event Description: Equipment Verifications			

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 2	BOP	**VERIFY** ESF systems ALIGNED: • Phase A ACTUATED: o PHASE A TRAIN A alarm LIT [M-6C, B5]. o PHASE A TRAIN B alarm LIT [M-6C, B6]. *(RNO)* a. **ACTUATE** PHASE A AND CNTMT VENT ISOL switches HS-30-63A and HS-30-63B. ***Critical Task**: Initiate at least one train of Phase A Containment Isolation prior to completion of ES-0.1* • Containment Ventilation Isolation ACTUATED: o CONTAINMENT VENTILATION ISOLATION TRAIN A alarm LIT [M-6C, C5]. o CONTAINMENT VENTILATION ISOLATION TRAIN B alarm LIT [M-6C, C6]. • Status monitor panels: o 6C DARK o 6D DARK o 6E LIT OUTSIDE outlined area o 6H DARK o 6J LIT. • Train A status panel 6K: o CNTMT VENT GREEN o PHASE A GREEN • Train B status panel 6L: o CNTMT VENT GREEN o PHASE A GREEN

Op Test No.: NRC	Scenario # 3	Event # ES-0.5	Page 61 of 62
Event Description: Equipment Verifications			

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** for containment spray and Phase B actuation: a. **CHECK** for any of the following: • Phase B ACTUATED **OR** • Containment pressure greater than 2.8 psig. b. **VERIFY** containment spray INITIATED: 1) Containment spray pumps RUNNING. 2) Containment spray header isolation valves FCV-72-39 and FCV-72-2 OPEN. 3) Containment spray recirculation valves to RWST FCV-72-34 and FCV-72-13 CLOSED. 4) Containment spray header flow greater than 4750 gpm per train. 5) Panel 6E LIT. *(RNO - 1B-B Cntmnt Spray Pmp will not start Auto or Manual)* b. **START** containment spray pumps and **ALIGN** valves as necessary. c. **VERIFY** Phase B ACTUATED: • PHASE B TRAIN A alarm LIT [M-6C, A5]. • PHASE B TRAIN B alarm LIT [M-6C, A6]. d. **ENSURE** RCPs STOPPED. *(Step continued in next Table Cell)*

Op Test No.: NRC Scenario # 3 Event # ES-0.5 Page 62 of 62

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	e. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN. • Panel 6L PHASE B GREEN. f. **CHECK** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48. g. **WHEN** 10 minutes have elapsed, **THEN** **ENSURE** containment air return fans RUNNING.
	BOP	**CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors • Appendix B, Containment Rad Monitors.
	BOP	**VERIFY** pocket sump pumps STOPPED: [M-15, upper left corner] • HS-77-410, Rx Bldg Aux Floor and Equipment Drain Sump pump A • HS-77-411, Rx Bldg Aux Floor and Equipment Drain Sump pump B.
	BOP	**DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	**ENSURE** plant announcement has been made regarding Reactor Trip and SI.

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Sim. Setup	Reset **IC- 16** Perform switch check. Allow the simulator to run for at least 3 minutes before loading SCEN file or starting the exercise. This will initialize ICS. **Load SCENS: NRC09C** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms.	Initialize simulator at 100 % RTP BOL **Place Mode 1 placard on panels.** **Place A Train Week sign on the simulator**
Active when SCENS loaded	imf RH01A f:1 ior ZLOHS7410A_GREEN f:0	1A-A RHR PUMP INOPERABLE. ***PLACE 1A-A RHR PUMP HS IN PTL AND TAG WITH HOLD ORDER.*** ***Place Protected equipment tags on B Train RHR Pump, SI Pump, Charging Pump, and Containment Spray Pump***
Event 1 When Directed by Lead Examiner insert: **Key-1**	irf ED120B1B007 f:0 k:1	120VAC BD 1-I BREAKER 7, CONTAINMENT RAD MAN 1-RE-9O-106 (Open Brkr) ***If Dispatched to 120 v vital power board I, report Bkr 7 to 1-RE-90-106 tripped. Report in ~ 3 min.*** ***If Dispatched to RM-90-106 report pump not running. Report in ~ 5 min. If asked, do not notice anything else abnormal locally such as odor etc.***
Event 2 After ARP and Tech Spec Eval complete as Directed by Lead Examiner insert: **Key-2**	imf CH01C f:100 k:2	CONTAINMENT PRESSURE TRANSMITTER FAILURE PDT-30-44 (100%) ***If MSS contacted report IM will report to MCR in ~45 min.***

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Event 3 when AOP and Tech Spec Eval complete as Directed by Lead Examiner insert: **Key-3**	imf HD03A f:1 k:3 imf HD06A f:60 k:3	#3 HEATER DRAIN PUMP A TRIP LCV-6-105A FAILS TO VARIABLE POSITION (60%) Results in BOP Runback in 3-5 min. ***If requested, provide tank level and valve position information from simulator diagram. Report in ~ 5 min.*** ***If dispatched to check pump, report motor is hot and smells like burnt insulation. Report in ~ 5 min*** ***If dispatched to check motor breaker report instantaneous overcurrent relay operation. Report in ~ 5 min.***
Event 4 Active when SCENS loaded	imf RD09 f:1	RODS FAIL TO MOVE IN AUTO ***If Operations personnel dispatched to check rod control system locally, respond the problem is not obvious locally. Maintenance will need to investigate. Report in ~ 5 min.***
Event 5 When AOP for HDT RB complete including reset of Turb and Steam Dump controls as Directed by Lead Examiner insert: **Key-4**	imf RX20 f:1 k:4	MAIN STEAM HEADER PRESSURE TRANSMITTER FAILS HI, PT-1-33 (Main Feedwater Pump Speed Increases) ***If Maintenance requested to investigate inform crew that IMs will report to the MCR in ~45 min to discuss the failure.***
Event 6 When MFP Speed and S/G levels are controlled and AOP is complete as Directed by Lead Examiner insert: **Key-5**	Imf RC05 f:50 k:5 {zdihs68333a}imf TH04A f:12	FAILURE OF PZR RELIEF VALVE PCV-68-334 (Fails 50% open and will not close manually blosck valve closure is required) PZR SAFETY FAILURE SV-68-563 (Fails partially open ~13 gpm leak) NOTE: Automatically Inserted when Block Valve FCV-68-333 is closed.

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Event 7	N/A	Initiate Rapid Plant shutdown using AOP-C.03 per AOP-R.05. ***If crew elects to shutdown using O-GO-5, provide the following input from Operations Management as required with Lead Examiner concurrence:*** ***Operations Management directs rapid shutdown using AOP-C.03 to minimize chance of SV leak worsening.***
Event 8 Modify SV Failure after load decrease complete as Directed by Lead Examiner.	mmf TH04A f:100	PZR SAFETY FAILURE SV-68-563 (Fails Full Open requiring Rx Trip and SI)
Event 8 (Cont'd) Event trigger 6 min after PRT rupture	{th_rupt}imf TH01B f:0.075 d:360	LOCA - HOT LEG LOOP 2 (~400 gpm) (Note: Provides additional RCS leakage to simulate more severe SV Failure)
Event 9 Active when SCENS loaded	imf RH01B f:1	RHR PUMP B TRIP ON START (Instantaneous Overcurrent) ***If dispatched to check pump locally report smell of burnt insulation. Report in ~5 min.*** ***If dispatched to check breaker locally, report instantaneous overcurrent relay operation. Report in ~5 min.***
Event 10 Active when SCENS loaded	imf RP17A f:1 imf RP17B f:1	FAILURE OF AUTO PHASE A ISOL - TRN-A FAILURE OF AUTO PHASE A ISOL - TRN-B (Can be manually actuated)
Event 11 Active when SCENS loaded	imf CSCOHS7210A f:2 ior ZLOHS7210A_GREEN f:1	CONTAINMENT SPRAY PUMP 1B AUTO/MAN START FAILURE OVERRIDE CONTAINMENT SPRAY BUMP 1B SWITCH GREEN LIGHT ON ***If dispatched to check pump or breaker report no obvious problem locally. Report in ~5 min.***

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
If crew requrest transfer of 1A Spray pump to Aux and closing locally wait ~ 3 min and insert: **Key-6**	ior AN_OV_609 f:2 k:6 ior ZLOHS7210A_RED f:0 k:6 ior ZLOHS7210A_GREEN f:0 k:6 ior ZLOHS7210A_WHITE f:0 k:6	6900V SD BD 1B-B XFER SW IN AUX MODE CNTMT SPRAY PMP B MTR SW - RED OFF CNTMT SPRAY PMP B MTR SW – GRN OFF CNTMT SPRAY PMP B MTR SW – WHT OFF ***After inserting key-6, wait ~2 min and report the pump would not start after transfer to Aux Control.***

Time: Now Date: Today

Unit 1 MCR Checklist (751-2428 ID 7636)

Part 1 - Completed by Off-going Shift / Reviewed by On-coming Shift	
Mode 1, 100% Power 1204 MWe PSA Risk: Green Grid Risk: Green RCS Leakage ID .02 gpm, UNID .01 gpm Cumulative Purge Time 50.5 Hours	NRC phone Authentication Code Until 0800 H3H8 After 0800 42DF

Common Tech Spec Actions

-

U-1 Tech Spec Actions

- *LCO 3.5.2 & 3.6.2.1 - 1A-A RHR pump has been tagged for 6 hours for maintenance to perform motor winding test. Expected Return to service is ~2 hours.*

Protected Equipment

- 1B-B RHR Pump
- 1B-B Safety Injection Pump
- 1B-B Charging Pump
- 1B-B Containment Spray Pump

Shift Priorities

-

Part 2 – Performed by on-coming shift

☒ Verify your current qualifications	☒ Review Operating Log since last held shift or 3 days, whichever is less	
☒ Standing Orders / Shift Orders	☒ TACF	☒ Immediate required reading
☒ LCO Actions		

Part 3 – Performed by both off-going and on-coming shift

☒ Walk down of MCR Control Boards

Time: Now Date: Today

MAIN CONTROL ROOM (7690)
• **Train_A_Week**
OUTSIDE (7666) [593-5214]
•
AUXILIARY BUILDING (7775)
• ***1A-A RHR pump has been tagged for 6 hours for maintenance to perform motor winding test. Expected Return to service is ~2 hours.***
TURBINE BUILDING (7771) (593-8455)
•

Time: Now Date: Today

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number	Date Scheduled

MCR WO List

ID And Noun Name	Panel	Problem Description	WO/PER Number	Date Scheduled

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1093** ppm Today		BA Controller Setpoint: **27%** *	RCS B-10 Depletion: **2** ppm
Operable BAT: **A**	BAT A Boron: **6850** ppm	BAT C Boron: **6850** ppm	RWST Boron: **2601** ppm
Nominal Gallons per rod step from 219: **7** gallons of acid, **36** gallons of water			

* Verify boric acid flow controller is set at Adjusted BA Controller Setting iaw 0-SO-62-7 section 5.1

Estimated values for a 1° Change in Tave **

Gallons of acid: **26**	Gallons of water: **138**	Rod Steps: **4**

Estimated rods/boron for emergency step power reduction **

(Assuming Xenon equilibrium and no reactivity effects due to Xenon. 2/3 total reactivity from rods, 1/3 from boron)

Power reduction amount	Estimated Final Rod Position	Estimated boron addition
10%	**198** Steps on bank D	**101** gallons
30%	**174** Steps on bank D	**295** gallons
50%	**152** Steps on bank D	**485** gallons

** These values are approximations and not intended nor expected to be exact. The values may be superseded by Rx Engineering or SO-62-7 calculated values. These values are calculated assuming 100% steady state power operation only. Engineering data last updated **one week ago**. Data Valid until **one week from now**.

Previous Shift Reactivity Manipulations

Number of dilutions: 0***	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 0	Gallons per boration: 0	Rod steps out: 0
Total amount diluted: 0	Total amount borated: 0	Net change: 0 IN/Out

Current Shift Estimated Reactivity Manipulations

Number of dilutions: 0	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 0	Gallons per boration: 0	Rod steps out: 0
Total expected dilution: 0	Total expected boration: 0	Net change: 0 In/Out

Remarks:

Rx Power – 100% MWD/MTU – 1000 Xenon & Samarium at Equilibrium

***The boron letdown curve is flat for the next 25 EFPD.

Next Unit 1 Flux Map is scheduled - <u>three weeks from now</u>

Unit 1 M-P is 0 PPM

Unit Supervisor: _____

Name/Date

Operations Chemistry Information

Boron Results					
Sample Point	**Units**	**Boron**	**Date / Time**	**Goal**	**Limit**
U1 RCS	ppm	1093	Today / Now	Variable	Variable
U2 RCS	ppm	816	Today / Now	Variable	Variable
U1 RWST	ppm	2601	Today / Now	2550 - 2650	2500 - 2700
U2 RWST	ppm	2569	Today / Now	2550 - 2650	2500 - 2700
BAT A	ppm	6850	Today / Now	Variable	Variable
BAT B	ppm	6850	Today / Now	Variable	Variable
BAT C	ppm	6850	Today / Now	Variable	Variable
U1 CLA #1	ppm	2556	Today / Now	2470-2630	2400-2700
U1 CLA #2	ppm	2575	Today / Now	2470-2630	2400-2700
U1 CLA #3	ppm	2591	Today / Now	2470-2630	2400-2700
U1 CLA #4	ppm	2589	Today / Now	2470-2630	2400-2700
U2 CLA #1	ppm	2531	Today / Now	2470-2630	2400-2700
U2 CLA #2	ppm	2650	Today / Now	2470-2630	2400-2700
U2 CLA #3	ppm	2522	Today / Now	2470-2630	2400-2700
U2 CLA #4	ppm	2526	Today / Now	2470-2630	2400-2700
Spent Fuel Pool	ppm	2547	Today / Now	≥ 2050	≥ 2000
Lithium Results				**Goal**	**Midpoint**
U1 RCS Lithium	ppm	1.1	Today / Now	>1	>1
U2 RCS Lithium	ppm	2.43	Today / Now	2.18-2.48	2.33

Primary to Secondary Leakrate Information (Total CPM RM-90-99/119)					
Indicator	**Units**	**U1**	**Date / Time**	**U2**	**Date/Time**
SI 50 S/G Leakage?	Yes/No	No	Today / Now	No	Today / Now
SI 137.5 CVE Leakrate	gpd	< 0.1	Today / Now	< 0.1	Today / Now
5 gpd leak equivalent	cpm	380	Today / Now	68	Today / Now
30 gpd leak equivalent	cpm	1980	Today / Now	83	Today / Now
50 gpd leak equivalent	cpm	3250	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	4850	Today / Now	455	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cpm	50	Today / Now	40	Today / Now
Correction Factor 99/119	cpm/gpd	10.69	Today / Now	14.13	Today / Now

Steady state conditions are necessary for an accurate determination of leak rate using the CVE Rad Monitor

Facility:	Sequoyah	Scenario No.:	4	Op Test No.:	NRC
Examiners:		Operators:			

Initial Conditions: 100% Power BOL Equilibrium
1A-A RHR Pump Out of Service

Turnover: Unit 1 main Generator has developed a small H2 leak which cannot be repaired on line. Management has decided to shutdown the Unit to make repairs. Shutdown the Unit using 0-GO-5 over the next 8 hours.

Target CTs: Manually Close all 4 Main Steam Isolation Valves prior to transition to ECA-2.1.

Energize Shutdown board 1B-B from D/G 1B-B prior to placing equipment in PTL in ECA-0.0.

Event #	Malf. No.	Event Type*	Event Description
1	N/A	R-ATC N-SRO/BOP	Decrease power.
2	CC10A CC09B	TS-SRO C-SRO/BOP	1A-A CCS Pump trips and 1B-B CCS Pump fails to auto start. AOP-M.03 implemented. SRO Tech spec Evaluation.
3	RX07A RC06A	TS-SRO C-SRO/ATC	Controlling Przr Press Chan Fails Hi. LP 1 Przr spray valve Opens, LP 2 Przr Spray fails closed. Man action required to close Loop 1 Spray Valve. No action required for loop 2 Spray valve except to diagnose and initiate maintenance. Tech Spec Evaluation.
4	CV09	C-SRO/ATC	Volume control Tank level transmitter fails High. Letdown is diverted to HUT. Manually re-align to VCT.
5	FW05A	N/A	Main Feedwater Pump 1A trips on low oil pressure. AOP-S.01 is implemented.
6	TC10RLY1	C-SRO/BOP	Runback relay failure prevents Automatic Main Turbine Runback and Auto start of the Turbine Driven Auxiliary Feedwater pump and both Motor Driven AFW pumps when the MFP trips. Requires manual turbine runback and Manual AFW pump starts.
7	MS02A MS02B MS02C MS02D RP16K616A RP16K616B RP16K623A RP16K623B	M-All	Steam Line break outside containment downstream of MSIVs requiring Reactor Trip and Safety Injection. Manual isolation required due to auto failure of all 4 MSIVs.
8	EG02A	N/A	D/G 1A-A Generator Differential Trip 10 Sec after SI.
9	ED01	C-SRO/BOP	Loss off Offsite Power.
10	EG12B	C-SRO/BOP	1B-B D/G Breaker to Shutdown board 1B-B fails to auto close (Can be manually closed)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 4 Summary

Crew will assume shift at 100% power BOL with the 1A-A RHR pump out of service for repairs. Crew directions will be to shutdown the Unit using 0-GO-5 over the next 8 hours. Unit 1 main Generator has developed a small H2 leak which cannot be repaired on line. Management has decided to shutdown the Unit.

When adequate power decrease is complete, Component Cooling water pump 1A-A will trip and the standby pump (1B-B) will fail to auto start. SRO will implement AOP-M.03 and evaluate Tech Specs.

When AOP-M.03 and Tech Spec Evaluation complete, the controlling pressurizer pressure channel (PT-68-340) will fail high resulting in loop 1 pressurizer spray valves fully opening and requiring manual action to close to stop the RCS depressurization. The loop 2 Pressurizer spray valve incorrectly fails closed which requires no action except to diagnose the failure and initiate maintenance. The SRO will direct performance of AOP to select another controlling channel and return spray control to automatic. SRO will evaluate and enter applicable Reactor Protection and ESFAS instrumentation Technical specifications.

When AOP I.04 and Tech Spec Evaluation complete, Volume Control Tank level instrument LT-62-130A fails High which causes letdown to divert to the Holdup tank. ATC should refer to the Annunciator response procedure and manually realign letdown to the VCT. This instrument does not have an indicator in the main control room, however, indication is available on the plant computer system (ICS) and locally.

Following realignment of letdown to VCT, Main Feedwater Pump turbine 1A will trip due to low oil pressure from an oil line break. Due to a runback relay failure, MFW Pump trip will fail to initiate an auto main turbine runback to ~72% as designed and prevent auto start of all Auxiliary Feedwater pumps. Manual turbine runback and AFW pump start will be needed. AOP-S.01 will be implemented. The AFW pump Auto start failures should be addressed as prudent action or during performance of the AOP.

When Crew begins reset of turbine controls following the runback, a steamline break occurs downstream of MSIVs requiring Reactor trip and Safety Injection. The steam Line break will be isolated when the MSIVs are closed, however, due to a failure of the auto MSIV steamline isolation signals to all MSIVs the crew will manually close the MSIVs to complete the first critical task. Also, ten seconds after the 1A-A D/G starts from the SI signal it will trip due to a generator differential. The crew will continue in E-0 to check SI termination criteria.

When the crew begins checking the SI termination criteria in E-0, a loss of offsite power will occur. 1B-B D/G breaker to the shutdown board will not automatically close and will require manual closure to energize the 1B-B shutdown board. Crew may close the D/G Breaker to the shutdown board as prudent action or transition to ECA-0.0 which contains procedural direction for closing the breaker. Energizing the 1B-B Shutdown Board from the 1B-B D/G will complete the second critical task.

The scenario may be terminated when the 1B-B Shutdown board is energized from a D/G 1B.

Op Test No.:	NRC	Scenario #	4	Event #	1	Page	1	of 39
Event Description:	Decrease Power							

Time	Position	Applicant's Actions or Behavior
Console Operator: **No action required for Event 1**		
Indications available: **None: Crew will initiate power reduction IAW 0-GO-5 Section 5.3.**		
	SRO	Direct a load reduction in accordance with 0-GO-5 Normal Power Operations, Section 5.3, and 0-SO-62-7 Boron Concentration Control, Section 6.4.
Evaluator Note: Following Steps are from 0-SO-62-7 *Boron Concentration Control, Section 6.4*		
CAUTION: Returning the Boric Acid Blender to service after unplugging, cleaning, or maintenance on Boric Acid System could introduce debris, sludge, air or solidified boron into CCP suction resulting in pump damage. Extreme care must be exercised to properly flush the Boric Acid piping following an outage.		
NOTE: If a large amount of boration is required (plant shutdown), pzr heaters should be energized to cause spray operation for equalizing boron concentration in RCS and pressurizer.		
	RO	**ENSURE** makeup system aligned for **AUTO** operation in accordance with Section 5.1.
NOTE Steps 2 and 3 are **N/A** for minor power changes OR if immediate boration is required to maintain shutdown margin, to maintain rods above the insertion limit, during an emergency shutdown (AOP-C.03), during recovery of a dropped/misaligned rod (AOP-C.01), or at Chemistry recommendation in mode 3, 4, 5 or 6.		
	RO	**RECORD** the quantity of boric acid required to achieve desired boron concentration using Appendix D. _____ gals
	Crew	**PERFORM** Appendix I Independent Verification of Calculation for Amount of Boric Acid or Primary Water. (N/A if App. D was performed by SRO to verify data from Rx Engineering)

Op Test No.: NRC Scenario # 4 Event # 1 Page 2 of 39

Event Description: Decrease Power

Time	Position	Applicant's Actions or Behavior
	RO	**DETERMINE** available boric acid volume in in-service BAT. _____ gals
	RO	**PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **STOP** position.
	RO	**PLACE [HS-62-140B]**, CVCS Makeup Selector Switch to the **BORATE** position.
	RO	**ADJUST [FC-62-139]**, Boric Acid Flow Controller to the desired flow rate.
	RO	**SET [FQ-62-139]**, Batch Integrator to the desired quantity.
	RO	**PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **START** position.
	RO	**ENSURE** Boric Acid Pump aligned to blender in FAST speed by right red light **LIT** on **[HS-62-230A] OR [HS-62-232A]**.
NOTE Flow oscillations and/or erratic controller response may require manual operation of Boric Acid Flow Controller **[FC-62-139]** until stable conditions exist.		
	RO	**VERIFY** Boric Acid Flow established.
NOTE It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.		
	RO	**IF** reactor is critical, **THEN MONITOR** nuclear instrumentation and reactor coolant temperature to ensure proper response from boration.
NOTE BAT operability limits are prescribed by TRM 3.1.2.6 (Modes 1-3) or 3.1.2.5 (Modes 4-6).		
	RO	**MONITOR** Boric Acid Storage Tank level.
	RO	**IF** Volume Control Tank level increases to 63 percent, **THEN ENSURE [LCV-62-118]**, Volume Control Tank Divert Valve **OPENS** to divert excess water to the Holdup Tank.

Op Test No.: NRC Scenario # 4 Event # 1 Page 3 of 39

Event Description: Decrease Power

Time	Position	Applicant's Actions or Behavior
		NOTE Sample may be obtained at normal RCS sample intervals provided the unit is at power and the unit response following the boration is as expected.
	RO	**WHEN** boration is complete, **THEN** • **PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **STOP** position. • **CHECK** no primary water flow on either **[FI-62-142A] OR [FQ-62-142]**. • **ENSURE [FC-62-142]**, Primary Water to Blender Flow • Controller is in **AUTO** position and the potentiometer (dial indicator) is set at 35%. • **ADJUST [FC-62-139]**, Boric Acid Flow Controller to the desired blend solution in accordance with TI-44 Boron Tables. • **ENSURE [FCV-62-128]** is **CLOSED**. • **PLACE [HS-62-140B]**, CVCS Makeup Selector Switch to the **AUTO** position. • **PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **START** position. **IF** RCS boron sample required, **THEN NOTIFY** Chem Lab to obtain RCS boron sample.
		NOTE Boration is done in batches until the total boron and/or power change is completed.
	RO	**REPEAT** this section as required to complete total boron change.
	RO	**WHEN** total boration is complete, **THEN:** • **REALIGN** the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1. **NOTIFY** Chem Lab to obtain RCS boron sample.

Op Test No.: NRC	Scenario # 4	Event # 1	Page 4 of 39
Event Description: Decrease Power			

Time	Position	Applicant's Actions or Behavior
	US	**IF** in modes 1, 2, or 3, **THEN ENSURE** requirements of TRM 3.1.2.6 are met.

Evaluator Note: Following Steps are from 0-GO-5, *Normal Power Operation,* Section 5.3 Beginning at Notes prior to step 7.

NOTES

1) Guidance on restoration of EHC Controls after a BOP runback is contained in Appendix B, *Turbine Runback Restoration.*

2) For core operating recommendations for situations such as end of core life coast down or unusual power maneuvers, contact Reactor Engineering for guidance.

3) It is recommended that AFD be controlled within the target band.

4) The following general approach should be used during power reduction:
(a) borate RCS to reduce RCS TAVG within limits of TREF, (b) reduce turbine load to match TREF with TAVG (c) periodically take rod control to MANUAL from AUTO and insert the bank to move AFD near the target value, (d) return rod control to AUTO when not using the bank to control AFD, and (e) repeat the above as necessary to accomplish the load change.

5) Actions effecting reactivity are directed in the following step. 0-SO-62-7 requirements shall be adhered to for reactivity changes (i.e. reactivity balance, amounts of boric acid or water). All appropriate verifications and peer checks shall be utilized during performance.

	BOP	**INITIATE** a load reduction.
	BOP	**MONITOR** turbine load decreasing.

Op Test No.: NRC Scenario # 4 Event # 1 Page 5 of 39

Event Description: Decrease Power

Time	Position	Applicant's Actions or Behavior
		MONITOR MFP discharge pressure: **DETERMINE** MFP D/P Program setpoint using Appendix A. **IF** auto control of any MFWP controller is **NOT** functional, **THEN** **ADJUST** MFWP speed as necessary to maintain MFWP A and B flow/speed approximately matched **USING** one of the following: MFWP speed controller in **MANUAL** **OR** Gov Vlv Positioner **USING** 1, 2-SO-2/3-1, Sect 8.6.
CAUTION **Do NOT exceed a load change rate of plus or minus 5%/minute or a step change of 10%**		
NOTE TAVG is programmed from 578.2°F at 100% power to 547°F at zero power at a rate of 0.312°F per % power.		
	Crew	**MONITOR** the following during the load reduction: TAVG following TREF program. All RPIs, group step counters for rod insertion limits and inoperable rods or rod misalignment, Loop ΔT, and NIS for correct power distribution and quadrant power tilts. Core AFD within ~5% control band around the power level dependent target value.

Op Test No.: NRC	Scenario # 4	Event # 1	Page 6 of 39
Event Description: Decrease Power			

Time	Position	Applicant's Actions or Behavior
		NOTE Valve position limit and governor control meter are displayed on EHC Display panel 1, 2-XX-047-2000 (M-2).
	BOP	Valve position limit approximately 10% above the current governor control indication as turbine load is changed.
When power has been decreased sufficiently lead examiner may cue the next event at his discretion.		

Op Test No.: NRC	Scenario # 4	Event # 2	Page 7 of 39
Event Description:	1A-A Component Cooling Water Pump Trip &Stby CCS Pmp 1B-B Auto start fails		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 2		
Indications available: • 0-AR-M27-B-A, A1, CCS REAC BLDG SUPPLY HEADER FLOW LOW • 0-AR-M27-B-A, E4, ERCW/CCS PUMP MOTOR TRIP • 1B-B CCS Pump not running.		
	BOP	Implement applicable steps from alarm response procedure(s): **0-AR-M27-B-A, E4, ERCW/CCS PUMP MOTOR TRIP** [1] IF ERCW pump motor TRIPS, THEN GO TO AOP-M.01, *Loss of Essential Raw Cooling Water.* [2] IF CCS motor trip, THEN GO TO AOP-M.03, *Loss of Component Cooling Water.* [3] DETERMINE which motor tripped. [4] TURN control switch to OFF position to reset alarm. [5] DISPATCH operator to investigate cause of alarm. [6] EVALUATE LCO 3.7.3 (CCS) or 3.7.4 (ERCW). **0-AR-M27-B-A, A1, CCS REAC BLDG SUPPLY HEADER FLOW LOW** [1] IF Phase B isolation, THEN CONTINUE with emergency procedure(s) in progress. [2] CHECK reactor building supply header flow by observing [1-FI-70-142]. [3] ENSURE CCS heat exchanger aligned properly in accordance with 1-SO-70-1, *Component Cooling Water System Train A.* [4] IF pump problem exists with inservice pump, THEN START standby CCS pump if available. [5] IF loss of component cooling water is suspected, THEN GO TO AOP-M.03, *Loss of Component Cooling Water.* *(Standby CCS Pump 1B-B may be started in accordance with this ARP, as prudent action or deferred until procedure directs start)*

Op Test No.:	NRC	Scenario #	4	Event #	2	Page	8	of 39
Event Description:	1A-A Component Cooling Water Pump Trip &Stby CCS Pmp 1B-B Auto start fails							

Time	Position	Applicant's Actions or Behavior
	SRO	Enter AOP-M.03, Loss of Component Cooling Water *(Applicable Section 2.1 steps begin next page)*
	SRO	*(Tech Spec Evaluation will most likely not be performed until AOP actions are complete)* **EVALUATE** the following Tech Specs for applicability: • 3.4.1.1, Reactor Coolant Loops and Coolant Circulation - Startup and Power Operation **N/A** • 3.4.1.2, Reactor Coolant System - Hot Standby **N/A** • 3.4.1.3, Reactor Coolant System - Shutdown **N/A** • 3.5.2, ECCS Subsystems Tavg ≥ 350°F **Action already in effect at turnover due to 1A-A RHR pump out of service.** • 3.5.3, ECCS Subsystems Tavg < 350°F **N/A** • 3.5.5, Refueling Water Storage Tank **N/A** • 3.6.2.1, Containment Spray Subsystems **Action already in effect at turnover due to 1A-A RHR pump out of service.** • 3.7.3, Component Cooling Water System **72 hour Action Applies** ***(Tech Spec Evaluation continued next page)***

Op Test No.: NRC Scenario # 4 Event # 2 Page 9 of 39

Event Description: 1A-A Component Cooling Water Pump Trip &Stby CCS Pmp 1B-B Auto start fails

Time	Position	Applicant's Actions or Behavior
		• 3.5.5, Refueling Water Storage Tank **N/A** • 3.6.2.1, Containment Spray Subsystems **Action already in effect at turnover due to 1A-A RHR pump out of service.** • 3.7.3, Component Cooling Water System **72 hour Action Applies**
		EVALUATE EPIP-1, Emergency Plan Classification Matrix.
	SRO	**DIAGNOSE** the failure: Determine section 2.1 applies (CCS Pump Trip or Failure) from table,
Evaluator Note: Section 2.1 Steps start here.		
CAUTION: The Containment Spray Pumps may experience bearing failure after 10 minutes of loss of CCS cooling.		
NOTE 1: When the associated TRAIN of CCS is out of service the CCPs, SI Pumps, and RHR Pumps are INOPERABLE for ECCS purposes due to not being able to fulfill its design function for sump recirculation. LCOs 3.5.2, 3.5.3, 3.6.2.1, 3.7.3 should be evaluated and appropriately entered by the SRO.		
NOTE 2: When CCS is out of service to mechanical seal HXs ONLY, the affected CCPs, SI Pumps, and RHR Pumps have been evaluated to be OPERABLE and AVAILABLE. These pumps can run indefinitely without CCS cooling water to mechanical seal HXs		
	BOP	ENSURE the following pump that is currently aligned to B Train RUNNING: • C-S CCS Pump OR • 1B-B CCS Pump OR • 2B-B CCS Pump *(Determines that the C-S Pump is aligned to the B train header)*

Op Test No.:	NRC	Scenario #	4	Event #	2	Page	10	of 39
Event Description:	1A-A Component Cooling Water Pump Trip &Stby CCS Pmp 1B-B Auto start fails							

Time	Position	Applicant's Actions or Behavior
	SRO	Go to Step 10
	BOP	IDENTIFY and LOCK OUT failed CCS Pump.
		CAUTIONS: • **Loss of component cooling water flow to the RCP motor, requires RCP be stopped within two (2) minutes.** • **Containment Spray Pumps may experience bearing failure during operation after 10 minutes of loss of CCS cooling.**
		NOTE 1: When the associated TRAIN of CCS is out of service the CCPs, SI Pumps, and RHR Pumps are INOPERABLE for ECCS purposes due to not being able to fulfill its design function for sump recirculation. LCOs 3.5.2, 3.5.3, 3.6.2.1, 3.7.3 should be evaluated and appropriately entered by the SRO.
		NOTE 2: When CCS is out of service to mechanical seal HXs ONLY, the affected CCPs, SI Pumps, and RHR Pumps have been evaluated to be OPERABLE and AVAILABLE. These pumps can run indefinitely without CCS cooling water to mechanical seal HXs
	BOP	ENSURE affected Unit's standby CCS Pump (aligned to Train A) RUNNING. *(If not previously started, 1B-B CCS pump should be started at this step to restore CCS flow to RCP motor)*
	BOP	CHECK Train A CCS Heat Exchanger inlet pressure NORMAL for present plant conditions. [1-PI-70-24A, 1A1/1A2 CCS HX] [2-PI-70-17A, 2A1/2A2 CCS HX] • Between 87 psig and 110 psig *(Determines pressure approximately 105 psig)*

Op Test No.: NRC	Scenario # 4	Event # 2	Page 11 of 39
Event Description:	1A-A Component Cooling Water Pump Trip &Stby CCS Pmp 1B-B Auto start fails		

Time	Position	Applicant's Actions or Behavior
	SRO	Go to Procedure and step in effect *(Tech Spec Evaluation will likely occur at this point)*
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
When directed to go to appropriate plant procedure and Tech Spec Evaluation complete, Lead Examiner may cue the next event		

Op Test No.:	NRC	Scenario #	4	Event #	3	Page	12	of 39

Event Description: Controlling Przr Press Chan PT-68-340 fails HI, Loop 2 Przr Spray vlv fails closed

Time	Position	Applicant's Actions or Behavior
Console Operator: **When directed, initiate event 3**		
Indications available: **Pressurizer Hi Pressure, Alarm Panel (M-6a, C-5)** **Pressurizer Pressure above Setpoint, Alarm Panel (M-5A, B-3)** **Loop 1 Pressurizer Spray valve open Indicating light (XI-68-340D) lit and Spray controller (PIC-68-340D) output maximum** **Loop 2 Pressurizer Spray valve open Indicating light (XI-68-340B) NOT lit with Spray controller (PIC-68-340B) output maximum**		
	RO	Manually close Loop 1 spray valve. (Immediate Action, should also note that Loop 2 Spray valve did not respond as designed)
	SRO	Enter and direct actions of **AOP-I.04, Section 2.3**.
NOTE Step 1 is an IMMEDIATE ACTION.		
	RO	**CHECK** normal spray valves CLOSED. (RNO)
	RO	**IF** RCS pressure is less than 2260 psig, **THEN CLOSE** affected spray valve(s) **USING** the following: PIC-68-340A, Master Pressure Controller. **OR** PZR Spray controllers PIC-68-340D (Loop 1) and/or PIC-68-340B (Loop 2).
	RO	**MONITOR** pressurizer pressure stable or trending to desired pressure.
	RO	**CHECK** PI-68-340A NORMAL. (RNO)

Op Test No.: NRC	Scenario # 4	Event # 3	Page 13 of 39
Event Description:	Controlling Przr Press Chan PT-68-340 fails HI, Loop 2 Przr Spray vlv fails closed		

Time	Position	Applicant's Actions or Behavior
	RO	**PERFORM** the following: a. **ENSURE** PRESS CONTROL SELECTOR switch XS-68-340D in PT-68-334 & 323. b. **ENSURE** LOOP TAVG T REC/SEL selector switch XS-68-2B in LOOP 2, 3, or 4. c. **ENSURE** PRESS REC CHANNEL SELECTOR XS-68-340B in PT-68-334, PT-68-323, or PT-68-322. d. **GO TO** Caution prior to Step 8.
CAUTION: RCS pressure changes and changes in RCS boron concentration (due to differences between pzr and RCS boron) may cause small change in core reactivity.		
	RO	**MONITOR** reactor power: a. **CHECK** reactor in Mode 1 or 2. b. **MONITOR** core thermal power for unexpected changes.
	SRO	**EVALUATE** the following Tech Specs for applicability: • 3.2.5 DNB Parameters (**N/A** unless RCS press decreased below 2205 psig) • 3.3.1.1 (3.3.1), Reactor Trip System Instrumentation **(Action 6 applies from Table 3.3-1 items 7,9, & 10)** • 3.3.2.1 (3.3.2), ESF Actuation System Instrumentation **Action 17 applies from Table 3.3-3 item 1d)** • 3.3.3.5 Remote Shutdown Instrumentation **(N/A)** • 3.4.4 Pressurizer Heaters (may be applicable while heaters are unavailable due to instrument failure) **(N/A)**

Op Test No.: NRC Scenario # 4 Event # 3 Page 14 of 39

Event Description: Controlling Przr Press Chan PT-68-340 fails HI, Loop 2 Przr Spray vlv fails closed

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK** PZR PRESS and PZR SPRAY controllers in AUTO. (RNO)
	RO	**WHEN** malfunction has been identified **AND** isolated or corrected, **THEN PERFORM** the following: a. **ENSURE** Master Pzr Pressure Controller PIC–68–340A Output Percent Meter is less than 40%. b. **ENSURE** PZR PRESS Controller, PZR SPRAY controller, and PZR HTRS in AUTO.
NOTE: If performing AOP in conjunction with AOP-I.11 for an Eagle LCP failure, then actions to hard trip bistables should be delayed until Eagle system reset is attempted. Actions to hard trip bistables must be completed within 6 hours UNLESS affected loop is restored to operable status by resetting Eagle rack.		
	SRO	**REMOVE** failed pressurizer pressure channel from service:
	RO	**CHECK** any pressurizer pressure channel INOPERABLE.
	RO	**CHECK** OTΔT setpoint on affected channel NORMAL. (RNO) **GO TO** Substep 11.d.
	SRO	**IF** any of the following conditions exists: • transmitter signal failed (entire instrument loop affected including OTΔT pressure input) **OR** • OTΔT pressure input potentially affected or status CANNOT be determined, **THEN PERFORM** applicable appendix:
	SRO	

PZR PRESSURE INSTRUMENT	CHANNEL	APPENDIX
P-68-340 (P-455)	I	A
P-68-334 (P-456)	II	B
P-68-323 (P-457)	III	C
P-68-322 (P-458)	IV	D

Op Test No.:	NRC	Scenario #	4	Event #	3	Page	15	of 39

Event Description: Controlling Przr Press Chan PT-68-340 fails HI, Loop 2 Przr Spray vlv fails closed

Time	Position	Applicant's Actions or Behavior
	SRO	**GO TO** appropriate plant procedure.
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
If Tech Specs have been evaluated, Proceed to next event at lead examiners discretion.		

Op Test No.:	NRC	Scenario #	4	Event #	4	Page	16	of 39

Event Description: Volume Control Tank Level Transmitter LT-62-130 Fails High

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 4		
Indications available: • Alarm XA-55-6C, A-3, "LS-62-129A/B VOLUME CONTROL TANK LEVEL HI-LOW" • 1-LT-62-130 Indication failing high (ICS or M-6 Trend Recorder)		
	RO	Refer to and perform applicable portions of Annunciator Response Procedure.
Evaluator Note: Several steps, notes, and cautions in the Annunciator response procedure do not apply to this failure. Only those that are applicable are listed in this event guide.		
CAUTION		**If actual level is permitted to become low, charging pump gas intrusion could occur. [C.5]**
NOTE 1		High failure of 1-LT-62-129A or 1-LT-62-130A defeats auto switch over to RWST on low level.
NOTE 3		High failure of 1-LT-62-130A will divert letdown and prevent Auto makeup. 1-LI-62-129 will indicate actual level.
	RO	**[1] COMPARE** indicated level between **[1-LI-62-129]** (1-M-6) and ICS computer point **L0112A** (1-LT-62-130).
	RO	**[3] IF** 1-LT-62-129A or 130A failed high, **THEN** **ENSURE [1-LCV-62-118]** in **VCT** position **USING [1-HS-62-118A] AND** manually operate as required to maintain VCT level. Low failure of 1-LT-62-130A will initiate Auto makeup.
Evaluator Note: SRO may discuss effect of failure as per Notes 1 and 3 above.		
Evaluator Note: The following Crew Brief and Notification actions are not contained in the procedure.		
	Crew	**Crew Brief** would typically be conduced for this event as time allows prior to the next event.
	Crew	**Notifications** should be addressed as applicable if not specifically addressed by the procedure or in the crew brief. Operations Management - Typically Shift Manager. Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
Lead Examiner may cue the next event when desired.		

Op Test No.:	NRC	Scenario #	4	Event #	5 & 6	Page	17	of 39

Event Description: MFW Pmp 1A Trips, Turb Runback fails, All AFW Pmps auto start fail.

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 5		
Indications Available: • Alarm XA-55-3B, A-2 "TRIPPED" • Alarm XA-55-3B, A-4 "MFPT A OIL PRESSURE LOW • Green Light on MFPT A Reset/Trip Switch HS-46-9A (M-3) Runback Relay Failure: • Main Turbine Runback NOT Automatically Initiated • TDAFW Pump fails to auto start • Both MDAFW Pumps fail to auto start.		
	SRO	Enter and direct actions of AOP-S.01, Section 2.3
	BOP	**VERIFY** turbine runback to less than 72% load (~880 Mwe). *(RNO)* **REDUCE** turbine load to less than 72% **USING** valve position limiter.
	RO	**VERIFY** control rods inserting automatically to match T-avg and T-ref.
	BOP	**ENSURE** running main feedwater pump FULLY LOADED: • Speed controller output at maximum. [M-3, SIC-46-20A or SIC-46-20B]
	BOP	**ENSURE** AFW pumps started: a. MDAFW Pumps RUNNING. [M-4] b. TDAFW Pump RUNNING. [M-3] *(If AFW Pumps not started previously as prudent action they should be started at this step)* c. TDAFW Pump LCVs OPEN. [M-3] d. MDAFW Pump recirculation valves CLOSED: [M-4] • FCV-3-400 • FCV-3-401

Op Test No.: NRC Scenario # 4 Event # 5 & 6 Page 18 of 39

Event Description: MFW Pmp 1A Trips, Turb Runback fails, All AFW Pmps auto start fail.

Time	Position	Applicant's Actions or Behavior
	BOP	**ENSURE** affected Main Feedwater Pump Turbine Condenser isolation valves CLOSED: a. Condenser A • FCV-2-205, Condensate Inlet • FCV-2-210, Condensate Outlet
	CREW	**ENSURE** the following steam generator blowdown valves CLOSED [M-4]: • FCV-1-7 • FCV-1-14 • FCV-1-25 • FCV-1-32
	RO	**MONITOR** steam generator levels returning to program level.
	RO	**MONITOR** control rods above insertion limit: • ROD CONTROL BANKS LIMIT LOW-LOW alarm NOT LIT. [M4-B, B-7] *(RNO if required)* **INITIATE** boration **USING** Appendix A.
	CREW	**DISPATCH** operator to investigate cause of main feedwater pump trip.
	CREW	**ENSURE** unit STABILIZED: • Rx Power STABLE. • S/G Levels STABLE. • Tavg - Tref approximately matched. • Steam dump valves CLOSED

Op Test No.:	NRC	Scenario #	4	Event #	5 & 6	Page	19	of	39

Event Description: MFW Pmp 1A Trips, Turb Runback fails, All AFW Pmps auto start fail.

Time	Position	Applicant's Actions or Behavior
NOTE: The load rejection circuit may require several minutes decay time before C-7 can be reset.		
	BOP	**IF** Steam Dumps are in Tavg Mode, **THEN** **RESET** Steam Dump Load Rejection Signal: a. **PLACE** HS-1-103A and 103B, Steam Dump Control, in OFF. b. **PLACE** HS-1-103D, Steam Dump Control, in RESET and VERIFY spring return to TAVG. c. **VERIFY** C-7, LOSS OF LOAD INTERLOCK permissive DARK. [M-4A, E-5] d. **ENSURE** Steam Dump demand is ZERO. e. **PLACE** HS-1-103A and 103B, Steam Dump Control, in ON.
	BOP	**RESTORE** turbine control **USING** Appendix B, Turbine Runback Restoration.
When Lead Examiner may cue the next event at their discretion.		

Op Test No.: NRC	Scenario # 4	Event # 7 & 8	Page 20 of 39
Event Description:	SteamLine Brk Outside Cntmnt & Auto Close Fail of All MSIVs, D/G 1A-A Trip		

Time	Position	Applicant's Actions or Behavior
Console Operator: When directed, initiate Event 7		
Indications Available: • Automatic Reactor Trip and Safety Injection (Within a few seconds) • 1st Out Alarm XA-55-4D, F-1 "STEAM LINE LO PRESS SI REACTOR TRIP" • All S/G Pressures Dropping uncontrolled • All MSIVs Open (Red Light on Handswitch) with "STEAM LINE LO PRESS SI REACTOR TRIP" Alarm actuated.		
Evaluator Note: Crew may close MSIVs based on E-0 foldout page at any time during performance of E-0. **Evaluator Note:** D/G failure occurs ~10 seconds after Safety Injection occurs. Crew will likely address this failure when the Immediate Actions are complete.		
	SRO	Enter and Direct Actions of E-0, "Reactor Trip Or Safety Injection"
NOTE 1: Steps 1 through 4 are immediate action steps. **NOTE 2:** This procedure has a foldout page.		
	RO	**VERIFY** reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps. • Neutron flux DROPPING
	BOP	**VERIFY** turbine TRIPPED: • Turbine stop valves CLOSED.

Op Test No.: NRC Scenario # 4 Event # 7 & 8 Page 21 of 39

Event Description: SteamLine Brk Outside Cntmnt & Auto Close Fail of All MSIVs, D/G 1A-A Trip

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** at least one train of shutdown boards ENERGIZED.
	RO	**DETERMINE** if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D].
	BOP	**PERFORM** ES-0.5, Equipment Verifications WHILE continuing in this procedure. *(ES-0.5 at end of Scenario Page31)*
	BOP	**DETERMINE** if secondary heat sink available: a. **CHECK** total AFW flow greater than 440 gpm. b. **CHECK** narrow range level greater than 10% [25% ADV] in at least one S/G. c. **CONTROL** feed flow to maintain narrow range level between 10% [25% ADV] and 50% in intact or ruptured S/Gs.

Op Test No.: NRC	Scenario # 4	Event # 7 & 8	Page 22 of 39
Event Description: SteamLine Brk Outside Cntmnt & Auto Close Fail of All MSIVs, D/G 1A-A Trip			

Time	Position	Applicant's Actions or Behavior
CRITICAL TASK 1	BOP/RO	**CHECK** if main steam lines should be isolated: a. **CHECK** if any of the following conditions have occurred: • Any S/G pressure less than 600 psig. **OR** • Any S/G pressure dropping UNCONTROLLED. **OR** • Phase B actuation. b. **ENSURE** MSIVs and MSIV bypass valves CLOSED. *(MSIVs will be closed if not previously performed)* *(Critical Task - Manually close all 4 MSIVs prior to transition to ECA-2.1)* c. **ENSURE** applicable Foldout Page actions COMPLETED.
	RO	**CHECK** RCP trip criteria: a. **CHECK** the following: • RCS pressure less than 1250 psig **AND** • At least one CCP **OR** SI pump RUNNING.

Op Test No.: NRC	Scenario # 4	Event # 7 & 8	Page 23 of 39
Event Description:	SteamLine Brk Outside Cntmnt & Auto Close Fail of All MSIVs, D/G 1A-A Trip		

Time	Position	Applicant's Actions or Behavior
	RO/BOP	**MONITOR** RCS temperatures: • **IF** any RCP running, **THEN** **CHECK** T-avg stable at or trending to between 547°F and 552°F. *(If No Perform RNO)* **IF** temperature less than 547°F and dropping, **THEN** **PERFORM** the following: a. **ENSURE** steam dumps and atmospheric reliefs CLOSED. b. **IF** cooldown continues, **THEN** **CONTROL** total feed flow: 1) **ENSURE** total AFW flow less than or equal to 600 gpm. 2) **MAINTAIN** total AFW flow greater than 440 gpm UNTIL narrow range level is greater than 10% [25% ADV] in at least one S/G.
	RO	**CHECK** pressurizer PORVs, safeties, and spray valves: a. Pressurizer PORVs CLOSED. b. Pressurizer safety valves CLOSED. c. Normal spray valves CLOSED. d. Power to at least one block valve AVAILABLE. e. At least one block valve OPEN.

Op Test No.: NRC Scenario # 4 Event # 7 & 8 Page 24 of 39

Event Description: SteamLine Brk Outside Cntmnt & Auto Close Fail of All MSIVs, D/G 1A-A Trip

Time	Position	Applicant's Actions or Behavior
	BOP	**DETERMINE** if S/G secondary pressure boundaries are INTACT: • **CHECK** all S/G pressures CONTROLLED or RISING. • **CHECK** all S/G pressures greater than 140 psig. *(Transition to E-2 should not be required if MSIVs have been closed)*
	BOP	**DETERMINE** if S/G tubes are INTACT: • All S/G narrow range levels CONTROLLED or DROPPING • Secondary radiation NORMAL **USING** Appendix A, Secondary Rad Monitors. (App. A performed in ES-0.5).
	RO/BOP	**DETERMINE** if RCS is INTACT: • Containment pressure NORMAL • Containment sump level NORMAL • LOWER COMPT TEMP HIGH alarm DARK. [M-5C, B1] • Containment radiation NORMAL **USING** Appendix B, Containment Rad Monitors. (App. B performed in ES-0.5)

Op Test No.:	NRC	Scenario #	4	Event #	7 & 8	Page	25	of	39

Event Description: SteamLine Brk Outside Cntmnt & Auto Close Fail of All MSIVs, D/G 1A-A Trip

Time	Position	Applicant's Actions or Behavior
Evaluator Note: The next Event should be initiated during performance of the next step.		
	CREW	**DETERMINE** if ECCS flow should be reduced: a. **CHECK** RCS subcooling based on core exit T/Cs greater than 40°F. b. **CHECK** secondary heat sink: • Narrow range level in at least one S/G greater than 10%. **OR** • Total feed flow to S/Gs greater than 440 gpm. c. **CHECK** RCS pressure STABLE or RISING. d. **CHECK** pressurizer level greater than 10%. e. **MONITOR** status trees. f. **GO TO** ES-1.1, SI Termination.
Lead Examiner should Cue the next event prior to Entry into ES-1.1		

Op Test No.:	NRC	Scenario #	4	Event #	9 & 10	Page	26	of	39

Event Description: Loss of Offsite Power, 1B-B D/G Supply Bkr to Shutdown BD Auto Close Fail

Time	Position	Applicant's Actions or Behavior

Console Operator: When directed, initiate Event 9

Indications available:

Loss of Offsite Power:

- Numerous alarms, buzzers, and white disagreement lights on component switches and switchyard breakers.
- Numerous Electrical board Voltages indicate 0 volts including the Shutdown Boards and Unit boards. (Battery supplied AC & DC boards will be energized)

D/G 1B-B SD Board Supply Breaker Auto Close Failure:

- O Volts on 1B-B Shutdown Board Voltage Indicator EI-57-66 on M-1
- D/G 1B-B Breaker 1914 Mimic on M-1 and Handswitch on M-26 green light.
- 1B-B Shutdown board load breaker mimic on M-1 red lights indicating no board differential operation.

Evaluator Note: Event guide assumes crew will enter ECA-0.0 to close D/G 1B-B supply breaker to SD BD 1B-B. Crew may perform this as Prudent action in which case ECA-0.0 is not required.

Evaluator Note: Scenario should be terminated when D/G Supply breaker to 1B-B SD Board is closed and board is energized.

Evaluator Note: Crew may designate and operator to perform AOP-P.01 for Loss of Offsite Power Reader Doer method. A partial Event Guide for **AOP-P.01** is included at the end of the scenario event guide if needed **(See page 35)**

	CREW	Diagnose Loss of Offsite power and both SD BDs De-Energized.
	SRO	Enter and direct action of ECA-0.0
NOTE	Steps 1, 2, and 3 are immediate action steps.	
		SUSPEND FRP implementation and **MONITOR** status trees for information only.

Op Test No.: NRC	Scenario # 4	Event # 9 & 10	Page 27 of 39
Event Description:	Loss of Offsite Power, 1B-B D/G Supply Bkr to Shutdown BD Auto Close Fail		

Time	Position	Applicant's Actions or Behavior
	RO	**VERIFY** reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers OPEN or DISCONNECTED • Neutron flux DROPPING
	BOP	**VERIFY** turbine TRIPPED: • ALL turbine stop valves CLOSED [SSPS status lights on M-6].
	RO	**ENSURE** RCPs STOPPED.
NOTE	Step 5 should be handed off to a Unit Operator.	
	CREW	**PERFORM** the following notifications: a. **NOTIFY** four AUOs to report to MCR immediately to be available as necessary for DC load shed and local operation of TD AFW LCVs. b. **NOTIFY** Site Security to station officers at key vital doors **USING** SSI-1, Security Instructions for Members of the Security Force.

Op Test No.: NRC	Scenario # 4	Event # 9 & 10	Page 28 of 39
Event Description:	Loss of Offsite Power, 1B-B D/G Supply Bkr to Shutdown BD Auto Close Fail		

Time	Position	Applicant's Actions or Behavior
	RO	**CHECK** RCS ISOLATED: a. Pressurizer PORVs CLOSED. b. Letdown isolation valves CLOSED: • FCV-62-69 • FCV-62-70 • FCV-62-72 • FCV-62-73 • FCV-62-74 c. Excess letdown isolation valves CLOSED: • FCV-62-54 • FCV-62-55 d. Reactor vessel head vents CLOSED: • FSV-68-394 • FSV-68-395 • FSV-68-396 • FSV-68-397
NOTE		• On loss of auxiliary control air, the TD AFW LCVs fail open. • Auxiliary air compressors are powered from 480V C&A Vent Boards 2A1-A and 2B1-B.

Op Test No.: NRC Scenario # 4 Event # 9 & 10 Page 29 of 39

Event Description: Loss of Offsite Power, 1B-B D/G Supply Bkr to Shutdown BD Auto Close Fail

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** AFW flow: a. **CHECK** TD AFW pump RUNNING. b. **CONTROL** TD AFW pump **USING** EA-3-1, MCR Operation of TD AFW Pump. *(EA-3-1 Steps at Page 38)* c. **MONITOR** Aux Control Air AVAILABLE: • BOTH Unit 2 Shutdown Boards ENERGIZED • Train A and B Aux Control Air pressure on 1-M-15 (prior to DC load-shedding). d. **MAINTAIN** AFW flow greater than 440 gpm UNTIL narrow range level greater than 10% [25% ADV] in at least one S/G. e. **CONTROL** S/G narrow range levels between 10% [25% ADV] and 50%.

Op Test No.: NRC	Scenario # 4	Event # 9 & 10	Page 30 of 39
Event Description:	Loss of Offsite Power, 1B-B D/G Supply Bkr to Shutdown BD Auto Close Fail		

Time	Position	Applicant's Actions or Behavior
CRITICAL ~~STEP~~ 2 TASK	BOP	**ATTEMPT** to restore power to any shutdown board on this unit: a. **RESET** D/G start lockout relays. [0-M-26] b. **EMERGENCY START** diesel generators. [M-1 switch and M-26 pushbutton] *(Steps a. & b. may not be performed since 1A-A D/G has differential fault and 1B-B D/G is already running)* c. **VERIFY** at least one shutdown board ENERGIZED from D/G on this unit. *(RNO Required)* c. **IF** any D/G is running on this unit, **AND** associated Shutdown Bd differential relay is NOT actuated (based on transformer breakers closed), **THEN** **PERFORM** the following: 1) **ENSURE** normal and alternate supply breakers OPEN for Shutdown Bd to be energized. 2) **ENSURE** D/G Synchronize switch in SYN position. 3) **CLOSE** D/G breaker for running D/G. *(Critical Task: Energize SD BD 1B-B from D/G 1B-B prior to placing equipment in PTL in ECA-0.0)*

TERMINATE SCENARIO WHEN D/G 1B-B SUPPLY BREAKER TO SD BD 1B-B IS CLOSED.

Op Test No.: NRC Scenario # 4 Event # ES-0.5 Page 31 of 39

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5 Actions
		VERIFY D/G ERCW supply valves OPEN.
	BOP	**VERIFY** at least four ERCW pumps RUNNING.
	BOP	**VERIFY** CCS pumps RUNNING: • Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S. *(1A-A CCS Pump will not be running due to earlier failure in the scenario)*
	BOP	**VERIFY** EGTS fans RUNNING.
	BOP	**VERIFY** generator breakers OPEN.
	BOP	**VERIFY** AFW pumps RUNNING: • MD AFW pumps • TD AFW pump.
		NOTE AFW level control valves should NOT be repositioned if manual action has been taken to control S/G levels, to establish flow due to failure, or to isolate a faulted S/G.
	BOP	**CHECK** AFW valve alignment: a. **VERIFY** MD AFW LCVs in AUTO. b. **VERIFY** TD AFW LCVs OPEN. c. **VERIFY** MD AFW pump recirculation valves FCV-3-400 and FCV-3-401 CLOSED.

Op Test No.: NRC Scenario # 4 Event # ES-0.5 Page 32 of 39

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** MFW Isolation: • MFW pumps TRIPPED • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	**MONITOR** ECCS operation: **VERIFY** ECCS pumps RUNNING: • CCPs • RHR pumps • SI pumps **VERIFY** CCP flow through CCPIT. **CHECK** RCS pressure less than 1500 psig. **VERIFY** SI pump flow. **CHECK** RCS pressure less than 300 psig. **VERIFY** RHR pump flow.

Op Test No.: NRC Scenario # 4 Event # ES-0.5 Page 33 of 39

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**VERIFY** ESF systems ALIGNED: • Phase A ACTUATED: o PHASE A TRAIN A alarm LIT [M-6C, B5]. o PHASE A TRAIN B alarm LIT [M-6C, B6]. • Containment Ventilation Isolation ACTUATED: o CONTAINMENT VENTILATION ISOLATION TRAIN A alarm LIT [M-6C, C5]. o CONTAINMENT VENTILATION ISOLATION TRAIN B alarm LIT [M-6C, C6]. • Status monitor panels: o 6C DARK o 6D DARK o 6E LIT OUTSIDE outlined area o 6H DARK o 6J LIT. • Train A status panel 6K: o CNTMT VENT GREEN o PHASE A GREEN • Train B status panel 6L: o CNTMT VENT GREEN o PHASE A GREEN

Op Test No.: NRC Scenario # 4 Event # ES-0.5 Page 34 of 39

Event Description: Equipment Verifications

Time	Position	Applicant's Actions or Behavior
	BOP	**MONITOR** for containment spray and Phase B actuation: a. **CHECK** for any of the following: • Phase B ACTUATED **OR** • Containment pressure greater than 2.8 psig.
	BOP	**CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors • Appendix B, Containment Rad Monitors.
	BOP	**VERIFY** pocket sump pumps STOPPED: [M-15, upper left corner] • HS-77-410, Rx Bldg Aux Floor and Equipment Drain Sump pump A • HS-77-411, Rx Bldg Aux Floor and Equipment Drain Sump pump B.
	BOP	**DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	**ENSURE** plant announcement has been made regarding Reactor Trip and SI.

Op Test No.:	NRC	Scenario #	4	Event #	AOP-P.01	Page	35	of 39
Event Description:	Loss Of Offsite Power							

Time	Position	Applicant's Actions or Behavior
		AOP-P.01 Actions
NOTE:	Steps 1 and 2 are immediate actions.	
	BOP	**CHECK** Diesel Generators RUNNING and supplying shutdown boards. *(RNO)* **EMERGENCY START** available D/Gs. **ENSURE** shutdown boards energized from running D/Gs. *(May attempt to close 1B-B D/G BKR to SD BD 1B-1 at this step)*
	BOP	**CHECK** ERCW supply valves to D/Gs OPEN.
	BOP	**NOTIFY** SM to perform the following: a. **EVALUATE** EPIP-1, Emergency Plan Classification Matrix. b. **INITIATE** staffing of TSC and OSC **USING** Emergency Paging System.
	BOP	**MONITOR** BOTH 6900V shutdown boards on this unit ENERGIZED. *(RNO)* **IF** NO 6900V shutdown board is ENERGIZED on this unit, **THEN** **PERFORM** the following: a. **IF** unit is in Modes 1-3, **THEN** **ENSURE** ECA-0.0 has been entered.

Op Test No.: NRC	Scenario # 4	Event # AOP-P.01	Page 36 of 39
Event Description: Loss Of Offsite Power			

Time	Position	Applicant's Actions or Behavior
	BOP	**RECORD** time of loss of off-site power.
	BOP	**MONITOR** diesel generator loading: a. **VERIFY** D/G load sequencing **USING** Appendix B, Loss of Offsite Power Diesel Generator Load Sequence **[C.2]**. b. **ENSURE** four ERCW pumps RUNNING (one per shutdown board). c. **MONITOR** diesel generator(s) load less than or equal to 4.4 MW (4.8 MW for 2 hours).
	BOP	**CHECK** charging system operation: a. **ENSURE** all RCS dilution activities STOPPED. b. **ENSURE** CCP suction aligned to RWST: 1) **OPEN** LCV-62-135 or LCV-62-136. 2) **CLOSE** LCV-62-132 or LCV-62-133.
CAUTION 1	**Failure to promptly restart air compressors and restore non-essential air to containment will delay restoration of letdown. This may result in uncontrolled pressurizer level rise and PORV opening.**	
CAUTION 2	**LCO 3.7.15 (for Train A MCR Chiller) and TR 3.7.14 (for Train A EBR Chiller) may apply if 0-FCV-67-205, Train A ERCW to Station Air Compressors, is open with ERCW temperature greater than 81°F.**	
NOTE	Starting control air compressors will add about 0.1 MW to D/G 1A-A and 1B-B.	

Op Test No.: NRC	Scenario # 4	Event # AOP-P.01	Page 37 of 39
Event Description: Loss Of Offsite Power			

Time	Position	Applicant's Actions or Behavior
	RO	**RESTORE** control air: a. **PLACE** MSIV handswitches in CLOSE position. b. **ENSURE** one of the following valves OPEN to establish ERCW to station air compressors: • FCV-67-208, Train B (preferred) OR • FCV-67-205, Train A. c. **DISPATCH** an operator to start Station Air Compressors A and B **USING** EA-32-2, Establishing Control and Service Air. d. **ENSURE** auxiliary air compressors RUNNING. [M-15 or AB el 734] e. **CHECK** Phase B NOT actuated. f. **WHEN** control air pressure is restored, **THEN** **RESTORE** air to containment **USING** EA-32-1, Establishing Control Air to Containment.

Op Test No.: NRC	Scenario # 4	Event # ECA-3-1	Page 38 of 39
Event Description: MCR Operation of TD AFW Pump			

Time	Position	Applicant's Actions or Behavior

Evaluator Note: All Steps would typically be performed by BOP

NOTES

- TD AFW LCVs open on an accident signal.
- The high pressure air bottle can provide sufficient air volume and pressure to close the associated TD AFW LCV at least four times.
- S/G 1 and 2 TD AFW LCVs fail open on loss of Train B air. S/G 3 and 4 TD AFW LCVs fail open on loss of Train A air.
- Unit 1 TD AFW pump normal and alternate control power supplies are from Unit 2 120 V AC and 125 V DC vital instrument power.
- Unit 2 TD AFW pump normal and alternate control power supplies are from Unit 1 120 V AC and 125 V DC vital instrument power.

1. **SELECT** applicable unit:
   - Unit 1 ☐
   - Unit 2 ☐

2. **ENSURE** trip/throttle valve [FCV-1-51] OPEN

Op Test No.: NRC Scenario # 4 Event # ECA-3-1 Page 39 of 39

Event Description: MCR Operation of TD AFW Pump

Time	Position	Applicant's Actions or Behavior

3. **ESTABLISH** TD AFW Pump control:

   a. **IF** TD AFW flow is greater than 985 gpm, **THEN** **CLOSE** TD AFW LCVs as necessary to obtain flow less than 985 gpm.

   b. **RESET** accident signal on TD AFW pump.

   c. **PLACE** TD AFW pump speed controller in PULL TO MANUAL.

4. **OPERATE** TD AFW pump manually to maintain TD AFW pump speed less than 4000 rpm (normal speed is 3970 rpm).

5. **MAINTAIN** TD AFW pump flow less than 985 gpm.

7. **WHEN** level in at least one S/G greater than 10% [25% ADV], **THEN** **CONTROL** AFW to maintain Intact S/G level between 10% [25% ADV] and 50%.

8. **RETURN TO** procedure and step in effect.

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Sim. Setup	Reset **IC- 16** Perform switch check. Allow the simulator to run for at least 3 minutes before loading SCEN file or starting the exercise. This will initialize ICS. **Load SCENS: NRC09D** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms.	Initialize simulator at 100 % RTP BOL **Place Mode 1 placard on panels.** **Place A Train Week sign on the simulator**
Active when SCENS loaded	imf RH01A f:1 ior ZLOHS7410A_GREEN f:0	1A-A RHR PUMP INOPERABLE. ***PLACE 1A-A RHR PUMP HS IN PTL AND TAG WITH HOLD ORDER.*** ***Place Protected equipment tags on B Train RHR Pump, SI Pump, Charging Pump, and Containment Spray Pump.***
Event 1		Initiate Unit Shutdown for Main Gen H2 Leak Repair.
Event 2 When sufficient Load decrease complete as Directed by Lead Examiner insert: **Key-1**	imf CC10A f:1 k:1	CCS PUMP A OVERCURRENT TRIP ***If personnel dispatched to motor report motor hot to the touch and burned electrical insulation odor. Report in ~ 5 min.*** ***If dispatched to Breaker, report Overcurrent Trip. Report in ~ 5 min.***
Event 2 Cont'd Active when SCENS loaded	imf CC09B f:1	DEFEAT AUTO-START OF CC PUMP 1B ***If dispatched to check pump or breaker locally report no obvious problem. Report in ~5 min.*** ***If maintenance is initiated, report loose wiring connection which has been repaired. Prior to reporting delete the malfunction. Report in ~20 min.***

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Event 3 when CCS AOP and Tech Spec Eval complete complete as Directed by Lead Examiner insert: **Key-2**	imf RX07A f:1 k:2 imf RC06A f:0 k:2	CONTROLLING PZR PRESSURE TRANSMITTER PT 68-340 FAILS HIGH PRZ SPRAY VALVE PCV-68-340B FAILS CLOSED (Will not open Auto or Man) ***When IMs or MSS contacted to trip bistables, inform the crew that the IMs will report to the MCR in ~ 45 minutes.***
Event 4 When PORV AOP and TS Eval complete complete as Directed by Lead Examiner insert: **Key-3**	imf CV09 f:1 k:3	VCT LEVEL TRANSMITTER FAILS HIGH; 130-A (Letdown is diverted to HUT can be manually re-aligned to VCT) ***If dispatched to check LI-62-129C in ACR report normal. If value requested report same as indicator on M-6 (Use camera to determine value). Report in ~ 5 min.*** ***If dispatched to check LI-62-130 Locally (Panel L-268) report 100%. Report in ~ 5 min.***
Event 5 When Letdown re-aligned to VCT complete as Directed by Lead Examiner insert: **Key-4**	imf FW05A f:1 k:4	TURBINE DRIVEN FEED PUMP A TRIP (lo Oil Pressure) ***If dispatched to check the pump report significant oil line leak locally. If oil pumps (normal and DC emergency) are stopped the leak will decrease to trickle. Modify report accordingly. Report in ~ 3 min.*** ***Role play as Fire OPS personnel and contain the spill as required.*** ***Role play as Envoirnmental if contacted to evaluate the spill.***
Event 6 Active when SCENS loaded	imf TC10RLY1 f:1	PS-47-13RLY1 FAILS LOW - (LOAD>80%, 1 MFP TRIP The following automatic actions fail due to this relay failure when the MFP Trips: (Note: Manual actions are available) • Main Turb auto runback does not occur • Turb AFW pump auto-start fails • Both MD AFW pumps auto-start fails

CONSOLE OPERATOR INSTRUCTIONS

ELAP. TIME	IC/MF/RF/OR #	DESCRIPTION
Event 7 When Turb control Restoration I/P (AOP-S.01) as Directed by Lead Examiner insert: **Key-5**	imf MS02A F:100 k:5 imf MS02B F:100 k:5 imf MS02C F:100 k:5 imf MS02D F:100 k:5	MAIN STEAM LINE BREAK Outside Cntmt on S/G # 1, 2, 3, & 4 (**Note**: Simulator Models limit Max individual S/G Break size. These 4 breaks are comparable to a 20% Design Basis S/L Break and therefore will be reported to the crew as a single break on S/G #1). ***If dispatched to look for steam leak report large volume of steam coming from west valve vault room. MSIV closure will isolate the leak therefore, modify report as required based on MSIV status. Report in ~ 5 min.***
Event 7 (Cont'd) Active when SCENS loaded	IMF RP16K616A F:1 IMF RP16K616B F:1 IMF RP16K623A F:1 IMF RP16K623B F:1	Tr A Main Stm Isol signal to FCV-1-4/11 Fails Tr B Main Stm Isol signal to FCV-1-4/11 Fails Tr A Main Stm Isol signal to FCV-1-22/29 Fails Tr B Main Stm Isol signal to FCV-1-22/29 Fails (All four MSIV do not receive an Auto main steam isolation signal requiring manual closure.)
Event 8 Event Trigger 10 sec after SI	imf EG02A f:1 e:2 d:10	DIESEL GENERATOR TRIP DG 1A-A - (D/G Differential Trip 10 Sec after SI) ***If dispatched to check D/G report Gen Differential Relay actuation. Report in ~ 10 min.***
Event 9 When crew starts checking SI termination criteria in E-0 as Directed by Lead Examiner insert: **Key-7**	imf ED01 f:1 k:7	TOTAL LOSS OF OFFSITE POWER ***Report Grid disturbance from load dispatcher time to recover not yet known. Call and report in ~ 5 min.*** ***If Unit 2 Status Requested, Unit 2 is tripped and stable, both 6.9 Kv Shutdown Boards are energized from D/Gs, no other problems at this time.***
Event 10 Active when SCENS loaded	imf EG12B f:1	DG 1B-B BREAKER 1914 AUTO CLOSE FAILURE (Bkr can be manually closed with Bkr switch after placing D/G 1B-B Synchronize switch in "SYNC" position at panel M-26)

Time: Now Date: Today

Unit 1 MCR Checklist (751-2428 ID 7636)

Part 1 - Completed by Off-going Shift / Reviewed by On-coming Shift

Mode 1, 100% Power 1204 MWe **PSA Risk: Green** **Grid Risk: Green** **RCS Leakage ID .02 gpm, UNID .01 gpm** **Cumulative Purge Time 50.5 Hours**	**NRC phone Authentication Code** **Until 0800 H3H8** **After 0800 42DF**

Common Tech Spec Actions

-

U-1 Tech Spec Actions

- ***LCO 3.5.2 & 3.6.2.1 - 1A-A RHR pump has been tagged for 6 hours for maintenance to perform motor winding test. Expected Return to service is ~2 hours.***

Protected Equipment

- **1B-B RHR Pump**
- **1B-B Safety Injection Pump**
- **1B-B Charging Pump**
- **1B-B Containment Spray Pump**

Shift Priorities

- **Unit 1 main Generator has developed a small H2 leak which cannot be repaired on line. Management has decided to shutdown the Unit to make repairs. Shutdown the Unit using 0-GO-5 over the next 8 hours. Initiate boration and rod insertion per Reactor Engineer SpreadSheet. Spreadsheet has been verified by the SRO/STA. 0-SO-62-7 Appendix E and D have been performed.**

Part 2 – Performed by on-coming shift

☒ Verify your current qualifications		☒ Review Operating Log since last held shift or 3 days, whichever is less
☒ Standing Orders / Shift Orders	☒ TACF	☒ Immediate required reading
☒ LCO Actions		

Part 3 – Performed by both off-going and on-coming shift

☒ Walk down of MCR Control Boards

Time: Now Date: Today

MAIN CONTROL ROOM (7690)
• **Train_A_Week**
OUTSIDE (7666) [593-5214]
•
AUXILIARY BUILDING (7775)
• ***1A-A RHR pump has been tagged for 6 hours for maintenance to perform motor winding test. Expected Return to service is ~2 hours.***
TURBINE BUILDING (7771) (593-8455)
•

Time: Now Date: Today

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number	Date Scheduled

MCR WO List

ID And Noun Name	Panel	Problem Description	WO/PER Number	Date Scheduled

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1093** ppm Today		BA Controller Setpoint: **27%** *	RCS B-10 Depletion: **2** ppm
Operable BAT: **A**	BAT A Boron: **6850** ppm	BAT C Boron: **6850** ppm	RWST Boron: **2601** ppm
Nominal Gallons per rod step from 219: **7** gallons of acid, **36** gallons of water			

* Verify boric acid flow controller is set at Adjusted BA Controller Setting iaw 0-SO-62-7 section 5.1

Estimated values for a 1° Change in Tave **

Gallons of acid: **26**	Gallons of water: **138**	Rod Steps: **4**

Estimated rods/boron for emergency step power reduction **

(Assuming Xenon equilibrium and no reactivity effects due to Xenon. 2/3 total reactivity from rods, 1/3 from boron)

Power reduction amount	Estimated Final Rod Position	Estimated boron addition
10%	**198** Steps on bank D	**101** gallons
30%	**174** Steps on bank D	**295** gallons
50%	**152** Steps on bank D	**485** gallons

** These values are approximations and not intended nor expected to be exact. The values may be superseded by Rx Engineering or SO-62-7 calculated values. These values are calculated assuming 100% steady state power operation only. Engineering data last updated **one week ago**. Data Valid until **one week from now**.

Previous Shift Reactivity Manipulations

Number of dilutions: 0***	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 0	Gallons per boration: 0	Rod steps out: 0
Total amount diluted: 0	Total amount borated: 0	Net change: 0 IN/Out

Current Shift Estimated Reactivity Manipulations

Number of dilutions: 0	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 0	Gallons per boration: 0	Rod steps out: 0
Total expected dilution: 0	Total expected boration: 0	Net change: 0 In/Out

Remarks:

Rx Power – 100% MWD/MTU – 1000 Xenon & Samarium at Equilibrium

***The boron letdown curve is flat for the next 25 EFPD.

Next Unit 1 Flux Map is scheduled - <u>three weeks from now</u>

Unit 1 M-P is 0 PPM

Unit Supervisor: _____

Name/Date

Operations Chemistry Information

Boron Results					
Sample Point	**Units**	**Boron**	**Date / Time**	**Goal**	**Limit**
U1 RCS	ppm	1093	Today / Now	Variable	Variable
U2 RCS	ppm	816	Today / Now	Variable	Variable
U1 RWST	ppm	2601	Today / Now	2550 - 2650	2500 - 2700
U2 RWST	ppm	2569	Today / Now	2550 - 2650	2500 - 2700
BAT A	ppm	6850	Today / Now	Variable	Variable
BAT B	ppm	6850	Today / Now	Variable	Variable
BAT C	ppm	6850	Today / Now	Variable	Variable
U1 CLA #1	ppm	2556	Today / Now	2470-2630	2400-2700
U1 CLA #2	ppm	2575	Today / Now	2470-2630	2400-2700
U1 CLA #3	ppm	2591	Today / Now	2470-2630	2400-2700
U1 CLA #4	ppm	2589	Today / Now	2470-2630	2400-2700
U2 CLA #1	ppm	2531	Today / Now	2470-2630	2400-2700
U2 CLA #2	ppm	2650	Today / Now	2470-2630	2400-2700
U2 CLA #3	ppm	2522	Today / Now	2470-2630	2400-2700
U2 CLA #4	ppm	2526	Today / Now	2470-2630	2400-2700
Spent Fuel Pool	ppm	2547	Today / Now	≥ 2050	≥ 2000
Lithium Results				**Goal**	**Midpoint**
U1 RCS Lithium	ppm	1.1	Today / Now	>1	>1
U2 RCS Lithium	ppm	2.43	Today / Now	2.18-2.48	2.33

Primary to Secondary Leakrate Information (Total CPM RM-90-99/119)					
Indicator	**Units**	**U1**	**Date / Time**	**U2**	**Date/Time**
SI 50 S/G Leakage?	Yes/No	No	Today / Now	No	Today / Now
SI 137.5 CVE Leakrate	gpd	< 0.1	Today / Now	< 0.1	Today / Now
5 gpd leak equivalent	cpm	380	Today / Now	68	Today / Now
30 gpd leak equivalent	cpm	1980	Today / Now	83	Today / Now
50 gpd leak equivalent	cpm	3250	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	4850	Today / Now	455	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cpm	50	Today / Now	40	Today / Now
Correction Factor 99/119	cpm/gpd	10.69	Today / Now	14.13	Today / Now

Steady state conditions are necessary for an accurate determination of leak rate using the CVE Rad Monitor

Unit 1

DELTA TIME (hrs)	REACTOR POWER (%)	POWER DEFECT (pcm)	ASSUMED ROD HT (steps)	INSERTED WORTH (pcm)	EXPECTED XENON (pcm)	DELTA RHO BORON (pcm)	BORON CONC (ppm)	DELTA PPM (ppm)	RECOMMEN DILUTION (gal)	RECOMME BORATION (gal)	IODINE CONC (% eq)	DATE/TIME
0	100.0	1702.4	216.0	-23.0	-2728.0	---	1093.0	---	---	---	99.9	Today
1	90.0	1530.3	200.0	-102.5	-2739.8	-80.7	1105.9	12.9	0	142	99.4	Today
2	80.0	1358.4	185.0	-199.2	-2784.3	-30.7	1110.8	4.9	0	54	98.0	Today
3	70.0	1193.8	175.0	-271.2	-2851.0	-26.0	1114.9	4.1	0	46	95.7	Today
4	60.0	1032.9	165.0	-344.1	-2933.1	-5.9	1115.8	0.9	0	10	92.7	Today
5	50.0	874.0	160.0	-385.3	-3026.3	-24.5	1119.7	3.9	0	43	89.0	Today
6	40.0	712.4	155.0	-425.8	-3128.3	-19.2	1122.8	3.1	0	34	84.6	Today
7	30.0	548.2	150.0	-465.7	-3237.5	-15.0	1125.2	2.4	0	26	79.8	Today
8	20.0	376.6	150.0	-472.9	-3353.8	-48.2	1132.9	7.7	0	85	74.4	Today

1000	MWD/MTU	Hold Tavg = Tref +/- 1.5F	Total	0 442
6850	BAT ppm			

Small hourly boration/dilution volumes may be accumulated for larger single additions

Reason for Maneuver: Unit Shutdown for Main Gen H2 Leak Repair

Date: Today

RxEng Name:

Comments:

APPENDIX E
Page 1 of 18

REACTIVITY BALANCE CALCULATION

NOTE 1 One calculation is required for each major change. Calculation is an approximation of required Boron change. Eyeball interpolation of graphs is expected.

NOTE 2 Dilution or Boration value for power change from P_1 % to P_2 % power in time period T with rods moving from step position R_1 to R_2. (Subscript convention: 1 = current point, 2 = target point)

[1] ENTER the following data:

DATA REQUIRED	DATA	Where To Get
Current RCS Boron	1093 ppm	Chem Lab or Estimate using Appendix O
Core Burnup	1000 MWD/MTU	ICS U0981
Current Reactor power	100% %	NIS or ICS
Final Reactor power	80% %	As required for plant conditions
Total Reactor Power change	20% Δ%	Δ Current and final Reactor power
Rate of Reactor power change	10 %/hr	As required for plant conditions
Number of hours to change power	2 hr(s)	As required for plant conditions
Current Rod Position	216 steps	ICS or MCR Board
Final Rod Position	185 steps	Estimate number of rod steps required to control ΔI and rod withdrawal requirements for power change.

APPENDIX E
Page 2 of 18

CAUTION **Follow sign conventions explicitly. (See Example Power Increase and Power decrease.)**

[2] CALCULATE change in boron concentration by performing the following:

Parameter	Where To Get	Calculation	Value
[a] $\Delta\rho_{\text{POWER DEFECT}}$	Attached Power Defect Curves: Unit 1: Figure 1, 2, or 3 Unit 2: Figure 8, 9, or 10.	1680 pcm PD_1 - 1350 pcm PD_2 = (current)	330 pcm $\Delta\rho_{\text{POWER DEFECT}}$ (negative for power increase)
[b] $\Delta\rho_{\text{XENON}}$	$Xenon_1$: From ICS* or REACTF (either current conditions or projection to initial condition). $Xenon_2$: From ICS* or REACTF (projection over time period T). *(ICS Xenon values must add negative sign).	**NOTE:** Xenon reactivity must be negative -2785 pcm XE_2 - (-2728) pcm XE_1 = (current)	-57 pcm $\Delta\rho_{\text{XENON}}$ (negative for rise in Xenon conc)
[c] $\Delta\rho_{\text{RODS}}$	Attached Rod Worth Curves: Unit 1: Figure 4, 5, or 6 Unit 2: Figure 11, 12, or 13.	-190 pcm $Rods_2$ - (-25) pcm $Rods_1$ = (current)	-165 pcm $\Delta\rho_{\text{RODS}}$ (negative for rod insertion)
[d] $\Delta\rho_{\text{POWER DEFECT + XENON + RODS}}$ (CHANGE IN REACTIVY DUE TO POWER DEFECT, XENON, AND RODS) [a] pcm $\Delta\rho$ POWER DEFECT + [b] pcm $\Delta\rho$ XENON + [c] pcm $\Delta\rho$ RODS =			108 pcm
[e] $\Delta\rho_{\text{BORON}}$ (CHANGE IN BORON REACTIVITY) ([d] pcm $\Delta\rho_{\text{POWER DEFECT + XENON + RODS}}$) X (-1) =			-108 pcm $\Delta\rho$ BORON
[f] $\Delta ppm_{\text{BORON}}$ (CHANGE IN BORON CONCENTRATION) ([e] pcm $\Delta\rho$ BORON) ÷ (-6.26 pcm/ppm Boron Worth) = from Fig. 7 (U-1) or Fig. 14 (U-2)			17.25 ppm (negative for dilution, positive for boration)

[3] ENSURE independently verified by SRO in accordance with Appendix J.
(N/A if performed by an SRO to verify data provided by Rx. Eng) N/A

APPENDIX D
Page 1 of 1

CALCULATION FOR AMOUNT OF BORIC ACID OR PRIMARY WATER (TI-44)

NOTE 1 One calculation is required for each major change.

NOTE 2 Boric acid amounts to achieve required RCS boron concentration may be significantly higher than calculated amounts if CVCS demin resins are removing boron. Amount of boron removal by mixed bed resins will depend on RCS boron, resin age, whether demin bed was previously borated, and letdown temperature. Chemistry should be consulted if required to evaluate resin bed removal.

[1] **IF** REACTF not used,
THEN
CALCULATE amount of primary water or boric acid required using TI-44.

RCS BORON	PPM CHANGE	AMOUNT PRIMARY WATER OR BORIC ACID
_____ppm Current		
_____ppm Target		
		TOTAL GAL(s)

NOTE REACTF data sheets are to be signed by the preparer and reviewer.

[2] **IF** REACTF used attach printout to procedure. ☑

NOTE IV is not required if appendix is performed by an SRO to verify data provided by Rx. Eng.

[3] **ENSURE** independently verified by an SRO in accordance with Appendix I. N/A
Initials

END OF TEXT