Facility: Sequoyah Scenario No.: 1 Op Test No.: 2010302

Examiners: ____________ Operators: ____________

____________ ____________

____________ ____________

Initial Conditions: ≈42% RTP

Turnover: Increase power according to 0-GO-5, Normal Power Operation

Target CTs: Throttle AFW Flow to Multiple Faulted SGs in order to minimize RCS cooldown rate before a severe (orange-path) challenge develops to the PTS CST

Event No.	Malf. No.	Event Type*	Event Description
1. T+0	N/A	R - RO N – SRO/BOP	Normal Power Increase
2. T+20	CV06B CV01B	C - RO TS - SRO	1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip- Delayed for operator response
2.a		N – RO/BOP	Letdown Restoration
3. T+35	CC14 CC20	C - BOP TS - SRO	Component Cooling Line Break (within make-up capacity) 1-FCV-70-63, Make-up Valve fails to open automatically
4. T+50	CV18B	C – RO TS - SRO	#2 RCP #2 Seal Failure
5. T+65	ZAITIC2448	C – BOP*	Gen H2 Temp Hx Cooling Water Controller failure
5.a*	RW09 ZDITIC2448SW1 ZDITIC2448SW3	R – RO*	H2 Cooler/Stator Cooling Loss - MT Trip, No Rx Trip*
6. T+70	MS03A MS03B MS03C MS03D	M - Crew	MS Safety Valves lift 1 per SG on all SGs

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

* - If crew chooses to Rx Trip vs. MT, insert Event 6 immediately following the Rx Trip

Scenario 1 Summary

The crew will assume the shift with the unit at ~42% RTP in MODE 1 in 0-GO-5 Section 5.1 Power Ascension From 30% to 100%. Shift directions are to continue power escalation to 100% RTP.

Following completion of crew turnover, at the SRO's direction, continue plant power escalation (Section 5.1 Power Ascension From 30% to 100% Step 23).

Following the plant power increase, at the direction of the Lead Examiner, initiate the next event, 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip. The crew may respond to the Auxiliary Lube Oil Pump actuation using 1-SO-62-1, Section 8.18, CCP Low Lube Oil Pressure or using alarm response procedures (ARPs) 1-AR-M6-C, D-3 and 1-AR-M1-B, E-3 that directs entry into AOP-M.09 for the CCP trip. The CCP trip will initiate Letdown isolation. After charging is restored and normal letdown returned to service, the SRO will identify Tech Specs: 3.5.2, TRM items: 3.1.2.4.

At the Lead Examiner direction, initiate the next event, a Component Cooling System leak occurs within the capacity of make-up however, the make-up flow control valve, 1-FCV-70-63 fails to open automatically requiring the operator action. Crew will respond by using ARPs 0-AR-M27B-B C-2, C-3 and, as necessary, AOP-M-03, Loss of Component Cooling Water, Section 2.4 to stabilize CCS inventory while continuing to identify the leak, which is outside containment. SRO will identify Tech Specs: 3.5.2, 3.6.2.1, 3.7.3.

Following TS identification, at Lead Examiner direction, initiate the next event, #2 RCP #2 Seal Failure- excessive seal leakage. The crew will respond using ARPs 1-AR-M5-B, A-3, B-2. The RO will follow the ARP directing #2 RCP Standpipe fill directing entry into AOP-R.04, Reactor Coolant Pump (RCP) Malfunctions Section 2.4 and 1-SO-68-2, RCP Ops for the failure. The SRO will identify Tech Specs 3.4.6.2.

Following TS identification, at Lead Examiner direction, initiate the next event, Main Generator (MG) high hydrogen gas temperatures due to Stator Water Cooling and Hydrogen Cooling RCW TCVs failing. The crew will respond to ICS and annunciator alarms. After determining that the H2 cooling water valve, 1-TIC-24-48 is not functioning in AUTOMATIC, the operators will take manual control and attempt to restore H2 temperature. Subsequently, 1-TIC-24-48 manual control will fail resulting in MG Stator temperature increase. The crew will respond using ARPs 1-AR-M1-A, A-1, B-4, that direct entry into AOP-S.06, Turbine Trip, Section 2.0 for the failure. If the unit is not reduced to <15% power within 45 seconds, an automatic MT trip will occur. Expectation is that the crew will trip the MT, stabilize plant power using manual Rod Control and Steam Dumps following the MT trip but prior to exceeding Reactor Trip conditions. Crew consideration to reduce power to<15% is not anticipated.

When the plant is stable, at Lead Examiner direction, initiate the next event, MS Safety Valves spurious actuation on (1 SV per SG) all SGs. The crew will respond using ARPs 1-AR-M5-A, A-6; 1-AR-M6-B A-7, B-7, C-7, D-7 directing entry into AOP-S.05, Steam or Feedwater Leak, Section 2.0. Once the steam leak is identified, the crew should trip the reactor and close the MSIVs as directed in AOP-S.05 since the MT is off line. If alarm 1-AR-M6-A E-2 actuates, indicating an excessive cooldown, the crew will manually trip the reactor.

Following the Reactor Trip, the crew will enter E-0, Reactor Trip or SI to stabilize the plant and diagnose the steam leak event. They should transition to E-2, Faulted Steam Generator Isolation then to ECA-2.1, Uncontrolled Depressurization of All Steam Generators to stabilize RCS cooldown by minimizing feedwater flow to affected SGs.

EOP flow: E-0 – E-2 - ECA-2.1.

Scenario Termination: as directed by the Lead Examiner; following completion of ECA-2.1, Step 14, SI termination determination.

PSA significant task: Start EDG, 1B-B CCP and RCP Seal Leak determination
PSA significant DAS: Multiple MSLB
PSA significant component failure: Secondary Safety Valve failure

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Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior
Simulator Operator: No action required for Event 1		
Indications available: None, Crew will perform plant power increase IAW 0-GO-5, Section 5.1.		
T = 0	Following completion of crew turnover, at the SRO's direction, the crew will increase plant power using Section 5.1 Power Ascension From 30% to 100% starting at Step 23.	
	SRO	Direct a load increase in accordance with 0-GO-5 Normal Power Operations, Section 5.1, Power Ascension From 30% to 100% According to shift briefing, the RO will use the reactor Engineering-provided reactivity spreadsheet to control Tave-Tref deviation during the power increase using 0-SO-62-7 Boron Concentration Control, Section 6.2 and Control Rods using 0-SO-85-1 Sections 6.4 & 6.5; they follow this event guide.
Evaluator Note: Turbine load at scenario initiation is ~38% indicated by HP Turbine Impulse Pressure indicators 1-PI-1-72 & 1-73.		
	SRO	[23] **WHEN** approximately 40% turbine load:
		[23.1] **VERIFY** annunciator XA-55-4A, window E-7:
	BOP	**C-20 AMSAC ARMED** is **LIT**.
	BOP	[23.2] **CLOSE** the drains on the operating main feedwater pump turbine (N/A other pump).

MFPT	DESCRIPTION	HANDSWITCH	POSITION	INITIALS
A	DRAIN VALVES	HS-46-14	CLOSED	________
B	DRAIN VALVES	HS-46-41	CLOSED	________

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Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior
		NOTES 1) With verbal approval from the Operations Superintendent, placing the second main feed pump in service may be deferred until power is approximately 55% (Unit 1) or 65% (Unit 2). Logic prevents opening the standby MFPT condenser isolation valves if the pump is **NOT** reset prior to exceeding 9 million lbs/hr flow on the running pump. 2) LCO 3.3.2.1 (3.3.2) functional unit 6.f (AFW start function for the trip of both MFPT) allows one channel to be inoperable in Mode 1 for up to 4 hours when starting up or shutting down the second MFPT.
	BOP	[24] **WHEN** approximately 40 to 45% turbine load, **THEN** **PLACE** second MFPT in service by performing the following:

Lead Examiner: when power change is sufficient for a reactivity manipulation, cue the next event.

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Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior
		0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute
Evaluator Note:		Dilutions performed using the RE-provided Reactivity Spreadsheet; during subsequent power escalation, large volume dilutions will be divided evenly over each hour as determined by the crew. Approximately 15 minutes delay is normal for Normal Dilution/Boration effects to affect reactor power/RCS temperature. An extra bank of pressurizer heaters (Back-up Group 1C) is energized from previous procedural direction to cause pressurizer spray operation for RCS/Pzr boron concentration equalization.
	RO	**[1] ENSURE** unit is NOT in a Tech Spec or TRM action that prohibits positive reactivity additions. **[C.1]**
	NOTE	HUT level increase of 1% is equal to 1380 gallons (TI-28 fig. C.21).
	RO	**[2] 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	______ %	______

Time	Position	Applicant's Actions or behavior
	RO	**[3] ENSURE** makeup system is aligned for **AUTO** operation in accordance with Section 5.1.
	RO	**[4] RECORD** the quantity of dilution water required to achieve desired boron concentration using Appendix D. (**N/A** for minor power changes) ________ gals
	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.
	RO	**[5] 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)
	RO	**[6] PLACE** **[HS-62-140A]**, Boric Acid Supply to Blender Flow Control Switch to the **STOP** position.

Op Test No.: NRC 2010302 Scenario # 1 Event # 1

Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior
0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute		
	RO	**[7] PLACE [HS-62-140B]**, CVCS Makeup Selector Switch to the **DILUTE** position.
	RO	**[8] ENSURE [HS-62-140D]**, Boric Acid Valve to the Blender is **CLOSED** (Green light is **LIT**).
	RO	**[9] SET [FQ-62-142]**, Batch Integrator for the desired quantity
	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	**[10] ADJUST [FC-62-142]**, Primary Makeup Water Flow Controller for the desired flow rate
	RO	**[11] 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	**[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]**.
	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	**[13] 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]**.

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Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior
		0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute
	NOTE	It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.
	RO	**[14]** **MONITOR** nuclear instrumentation and reactor coolant temperature to ensure the proper response from dilution.
	RO	**[15]** **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.
	RO	**[16]** **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]**.
		[c] **VERIFY** no primary water flow on either **[FI-62-142A]** **OR** **[FQ-62-142]**.
Lead Examiner may direct initiation of the next event at his discretion. Steps on the next several pages are associated with performance of repetitive dilutions and control rod motion, which are performed until all manipulations specified are complete.		
	RO	**[17]** **IF** power increase in progress and additional dilutions will be required, **THEN** use this table to re-perform steps **[4]** through **[18]** (next page)
	RO	**[19]** **REALIGN** the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1.
		[20] **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.
	RO	**[21]** **IF** RCS boron sample is required, **THEN NOTIFY** Chem Lab to obtain RCS boron sample.
		End of Section 6.2

Op Test No.: NRC 2010302 Scenario # 1 Event # 1

Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior

0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute

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. ______/______ 1st CV

[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:	42% Plant Power Increase						

Time	Position	Applicant's Actions or behavior
		0-SO-85-1, Control Rod Drive System, Section 6.4, Transferring from Manual to Auto Rod Control; & Section 6.5, Transferring from Auto to Manual Rod Control
Evaluator Note:		As stated in each section's procedural Step 1 Note 1, the operators will use a laminated copy of Sections 6.4 & 6.5 available on the book desk under the glass at 1-M-4. It is verified as current, in-effect revision routinely to assure currency.
	NOTE 1:	A laminated copy of this section can be maintained in the Unit Control Room for repetitive use for routine rod manipulations.
	NOTE 2:	Defeating or restoring Tavg/Delta T or NIS channel may cause step change in input to rod control. A delay of at least 3 minutes prior to returning rod control to automatic will allow lead/lag signal to decay off.
	NOTE 3:	This Section may be N/A if Rod Control is being returned to AUTO in response to a transient (runback) condition.
	RO	**[1] ENSURE** turbine power is greater than 15 percent.
	RO	**[2] ENSURE** Window 31 (E-3), LOW TURB IMPULSE PRESS ROD WITHDRAWAL BLOCKED C-5, Permissive light on panel **[XA-55-4A]** is **NOT LIT**.
	RO	**[3] ENSURE** less than 1 degree Tavg/Tref mismatch.
	RO	**[4] PLACE [HS-85-5110]**, Rod Control Mode Selector in the **AUTO** position.
	RO	**[5] VERIFY** Rod Speed Indicator **[SI-412]**, indicates 8 Steps/minute.
		End of Section 6.4
		Section 6.5, Transferring from Auto to Manual Rod Control
	NOTE 1:	A laminated copy of this section can be maintained in the Unit Control Room for repetitive use for routine rod manipulations.
	NOTE 2:	Manual rod withdrawal is inhibited by any of the following signals: A. C-1, High Flux Intermediate Range Monitor B. C-2, High Flux Power Range Monitor C. C-3, Overtemperature Delta-T D. D. C-4, Overpower Delta-T

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Event Description: 42% Plant Power Increase

Time	Position	Applicant's Actions or behavior
		0-SO-85-1, Control Rod Drive System, Section 6.4, Transferring from Manual to Auto Rod Control; & Section 6.5, Transferring from Auto to Manual Rod Control
	RO	[1] **PLACE [HS-85-5110]**, Rod Control Mode Selector in the **MANUAL** position.
	RO	[2] **VERIFY** Rod Speed Indicator **[SI-412]**, indicates 48 Steps/minute.
	RO	[3] **IF** control rod movement is required, **THEN ADJUST** position using **[HS-85-5111]**, Rod Control Switch.
	RO	[4] **IF** it is desired to leave **[HS-85-5110]**, Rod Control Mode Selector in Manual for an extended period of time, **THEN** **PLACE** this Section in the Active Procedures Book.
	RO	[5] **WHEN** it is desired to place **[HS-85-5110]**, Rod Control Mode Selector to Automatic, **THEN** **GO TO** Section 6.4.
		End of Section 6.5

Op Test No.: NRC 2010302 Scenario # 1 Event # 2 Page 9 of 53

Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Simulator Operator: When directed, initiate Event 2</td></tr>
<tr><td colspan="3">Indications/ Annunciators available:
Annunciators:
1-M-1
• 1-AR-M1-B, E-3, MOTOR TRIPOUT PNL 1-M-1 THRU 1-M-6
1-M-6
• 1-AR-M6-C, D-3, FS-62-93A/B CHARGING LINE FLOW ABNORMAL

Indications:
1-M-5
• 1-HS-62-104A, 1B-B CCP Handswitch Red Lube Oil Pressure Lo Light illuminates</td></tr>
<tr><td>T = 20</td><td>RO</td><td>Identifies Red Lube Oil Pressure Lo Light, notifies SRO
TS 3.5.2 Action a: w/ 1 or more trains inoperable & w/ at least 100% ECCS flow equivalent to a single OPERABLE ECCS train available, restore to OPERABLE status w/i 72 hrs or HT STBY w/i next 6 hrs & in HT SHDN w/i following 6 hrs.

TR 3.1.2.4: At least 2 CCPs shall be OPERABLE
Action: w/ only 1 CCP OPERABLE, restore at least 2 w/i 72 hrs or HT STBY & borated to a SDM equivalent to at least 1% delta k/k at 200°F w/i next 6 hrs; restore at least 2 CCPs to OPERABLE w/i next 7 days or HT SHDN w/i next 30 hrs.</td></tr>
<tr><td colspan="3">Evaluator Note: if RO identifies the lube oil condition, the crew should transfer CCPs using 1-SO-62-1, Section 8.10, (following); if the crew fails to identify the 1B-B CCP lo lube oil condition, at the 5-minute mark, 1B-B CCP will trip. ARPs will direct AOP-M.09 entry for the tripped CCP, including (following) SO-62-1 Section 8.10.</td></tr>
<tr><td></td><td></td><td>1-SO-62-1, Section 8.18
"CCP Low Lube Oil Pressure"</td></tr>
<tr><td></td><td>SRO</td><td>Directs implementation of 1-SO-62-1, Section 8.18 starting at Step 1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE 1: If the running CCP cannot be immediately stopped (i.e. during an accident or during solid water operations), then an operator should be dispatched to locally check oil pressure and oil reservoir level without delay.</td></tr>
<tr><td></td><td colspan="2">NOTE 2: CCP oil reservoir sight glass level guidance:
• Static Oil Level between 1/3 and 2/3 of sight glass height
• Operating Oil Level between 1/4 and 2/3 of sight glass height</td></tr>
<tr><td></td><td>BOP</td><td>[1] IF plant conditions do NOT allow swapping CCPs, THEN DISPATCH operator to verify adequate oil pressure on affected CCP <u>as soon as possible:</u></td></tr>
<tr><td></td><td></td><td><table><tr><th>PUMP</th><th>OIL PRESSURE INDICATOR</th><th>≥8.5 psig</th></tr><tr><td>1A-A CCP</td><td>1-PI-62-247A</td><td>☐</td></tr><tr><td>1B-B CCP</td><td>1-PI-62-244A</td><td>☐</td></tr></table></td></tr>
</table>

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Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
	CAUTION:	**Stopping a CCP during a boration or dilution will trap water in idle pump and stagnant piping which may cause a reactivity event when pump is restarted later**.
	NOTE:	Starting idle CCP may cause a small reactivity change if boron concentration in pump casing and suction/discharge piping is different than RCS. This reactivity change is normally negative due to drop in RCS boron over core life, but could be positive if RCS boron was lower when idle CCP was stopped.
	BOP	**[2] – [7.b] IF** 1A-A CCP red light for low lube oil pressure illuminates… Steps are **N/A;** Step [8] begins section for 1B-B CCP low lube oil conditions.
		[8] IF 1B-B CCP red light for low lube oil pressure illuminates while pump is in service, **AND** 1A-A CCP is available, **THEN** **ENSURE** "A" Train CCS and ERCW in service.
	NOTE:	When RCS temperature is less <350°F, LCO 3.4.12 requires one CCP to be incapable of injection into RCS. While swapping running CCPs, two CCPs may be capable of injecting for no more than one hour.
	SRO	**[9] IF** RCS temperature is <350°F…**N/A**
	NOTE:	CCP oil reservoir sight glass level guidance: • Static Oil Level between 1/3 and 2/3 of sight glass height • Operating Oil Level between 1/4 and 2/3 of sight glass height
		[10] DISPATCH appropriate operator to locally inspect 1A-A CCP to ensure it is ready for operation.
	RO	**[11] WHEN** ready to start 1A-A CCP, **THEN PLACE [1-HS-62-108A]** 1A-A CCP in **START**.
	NOTE:	Stopping a CCP may result in receipt of a motor overload annunciation and a momentary white indication light on 1-HS-62-104A. The white light NOT remaining on indicates proper relay operation.
	RO	**[12] WHEN** ready to shutdown 1B-B CCP, **THEN** **PLACE [1-HS-62-104A]** 1B-B CCP in **STOP**.
	NOTE:	If RCS temperature is <350°F, the following step, **[13]… N/A**

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Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
	CREW	**[14]** **IF** reactor is critical, **THEN MONITOR** core thermal power and T-avg.
		[15] **EVALUATE** CCP operability.
		[16] **INITIATE** maintenance on affected CCP.
		END OF SECTION
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 1A-A CCP is in service and 1B-B CCP stopped.		

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Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
		AOP-M.09, Loss Of Charging
	RO	Identifies Red Lube Oil Pressure Lo Light, notifies SRO
		TS 3.5.2 Action a: w/ 1 or more trains inoperable & w/ at least 100% ECCS flow equivalent to a single OPERABLE ECCS train available, restore to OPERABLE status w/i 72 hrs or HT STBY w/i next 6 hrs & in HT SHDN w/i following 6 hrs. TR 3.1.2.4: At least 2 CCPs shall be OPERABLE Action: w/ only 1 CCP OPERABLE, restore at least 2 w/i 72 hrs or HT STBY & borated to a SDM equivalent to at least 1% delta k/k at 200°F w/i next 6 hrs; Restore at least 2 CCPs to OPERABLE w/i next 7 days or HT SHDN w/i next 30 hrs.
Evaluator Note:		The crew did not identify the 1B-B CCP lo lube oil condition, 1B-B CCP will tripped, AOP-M.09 for the tripped CCP.
	SRO	Directs implementation of AOP-M.09 Section 2.0:
	RO	[1] **CHECK** any CCP RUNNING.
	RO	[2] **MONITOR** if CCP(s) should be stopped…**N/A**
	RO	[3] **CHECK** BOTH CCPs STOPPED.
	RO	[4] **ENSURE** normal letdown ISOLATED:
		• FCV-62-72 CLOSED • FCV-62-73 CLOSED • FCV-62-74 CLOSED.
	RO	[5] **ENSURE** excess letdown ISOLATED:
		• FCV-62-54 CLOSED • FCV-62-55 CLOSED.

Op Test No.: NRC 2010302 Scenario # 1 Event # 2 Page 13 of 53

Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
	CAUTION	**If both RCP thermal barrier cooling flow and seal injection flow have beer lost, RCP seals will overheat rapidly.**
	NOTE	If all RCP seal cooling has been lost, this AOP takes precedence over AOP-R.04, *RCP Malfunctions,* and AOP-M.03, *Loss of Component Cooling Water.*
	RO	**[6] MONITOR** RCP lower bearing and seal water temperatures:
		• **If** any RCP lower bearing temp or seal water temp is greater that 225°F, **THEN GO TO** Notes prior to Step 18.
	RO	**[7] CHECK** charging/seal injection header INTACT. (NO indication of rupture)
	RO	**[8] ENSURE** CCP suction path established:
		a. **CHECK** SI signal NOT actuated. b. **ENSURE** suction from VCT established: • VCT level greater than 13% • LCV-62-132 and LCV-62-133 VCT Outlet to CCP **OPEN.**
	CAUTION:	If gas intrusion is suspected, NO CCP should be started UNTIL CCP has been vented (addressed in later steps).
	RO	**[9] CHECK** if any CCP available for immediate start:
		• CCP available **AND** • gas intrusion is NOT suspected.
	CREW	**[10] DISPATCH** AUO to locally verify CCP is ready to be started.

Op Test No.: NRC 2010302 Scenario # 1 Event # 2 Page 14 of 53

Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
	NOTE	If RCP thermal barrier cooling is established and sufficient time exists for local inspection of the standby pump, then CCP start in Step 11 should be delayed until after inspection is completed.
	RO	**[11]** **START** available CCP. Operator Starts 1A-A CCP
	RO	**[12]** **CHECK** SI signal NOT actuated.
	RO	**[13]** **MONITOR** CCP suction aligned to VCT.
	SRO	**[14]** **ENSURE** normal charging and letdown established **USING** EA-62-5, Establishing Normal Charging and Letdown. (EA-62-5 follows this event guide)
	CREW	**[15]** **NOTIFY** STA or other available licensed operator to refer to App. A, Tech Spec Impacts.
	SRO	**[16]** **NOTIFY** SM to evaluate OPDP-9, Emergent Issue Response.
	SRO	**[17]** **GO TO** appropriate plant procedure.
		END OF TEXT

Op Test No.: NRC 2010302 Scenario # 1 Event # 2 Page 15 of 53

Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
Lead Examiner Note:	**Note, direct as necessary, which operator, RO or BOP performs L/D restoration.**	
EA-62-5, Establishing Normal Charging and Letdown.		
		4.0 OPERATOR ACTIONS
		4.1 Section Applicability
	SRO	2. **IF** normal letdown flow is to be established, **THEN GO TO** Section 4.3.
		4.3 Establishing Normal Letdown Flow
	NOTE	EA-62-3, Establishing Excess Letdown, may be utilized if Normal Letdown cannot be established.
	RO/BOP	1. **IF** charging flow **NOT** established, **THEN PERFORM** Section 4.2.
	RO/BOP	2. **VERIFY** pressurizer level greater than 17%.
		3. **ENSURE** letdown orifice isolation valves CLOSED:

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

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

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

Op Test No.: NRC 2010302 Scenario # 1 Event # 2 Page 16 of 53

Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td>NOTE</td><td>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.</td></tr>
<tr><td></td><td>RO/BOP</td><td>5. PLACE [HIC-62-78] in MANUAL, AND OPEN [TCV-70-192] to ~50%.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>6. PLACE letdown pressure controller [PCV-62-81] in MANUAL and ADJUST output between 40% and 50%, (50%-60% open).</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>7. ADJUST charging flow as necessary to prevent flashing in the letdown line.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>8. OPEN letdown orifice isolation valves as needed:</td></tr>
<tr><td></td><td></td><td><table>
<tr><th>LETDOWN ORIFICE ISOLATION VALVES</th><th>OPEN
√</th></tr>
<tr><td>FCV-62-72</td><td>☐</td></tr>
<tr><td>FCV-62-73</td><td>☐</td></tr>
<tr><td>FCV-62-74</td><td>☐</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>NOTE</td><td>Normal letdown pressure is 325 psig at normal operating temperature.</td></tr>
<tr><td></td><td>RO/BOP</td><td>9. ADJUST letdown pressure controller [PCV-62-81] output to obtain desired pressure.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>10. ADJUST letdown pressure controller [PCV-62-81] setpoint to match existing pressure.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>11. PLACE letdown pressure controller [PCV-62-81] in AUTO.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.:	NRC 2010302	Scenario #	1	Event #	2	Page	17	of	53

Event Description: 1B-B CCP Aux LO Pump Actuates w/1B-B CCP Trip

Time	Position	Applicant's Actions or Behavior
	NOTE	Normal letdown temperature is ~100°F.
	RO/BOP	12. **ADJUST [HIC-62-78A]** to obtain desired letdown temperature, as indicated on **[TI-62-78]**.
	RO/BOP	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/BOP	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, **THENPLACE [HIC-62-78A]** in AUTO.
	RO/BOP	15. **ENSURE** high temperature divert valve **[HS-62-79A]** in DEMIN position.
	RO/BOP	16. **ADJUST** charging and letdown as necessary to maintain RCP seal injection flow and pressurizer level.
		END OF TEXT

Op Test No.:	NRC 2010302	Scenario #	1	Event #	3	Page	18 of 53

Event Description: Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior

Simulator Operator: When directed, initiate Event 3

Indications/Alarms

Annunciator:

0-M-27B

- **0-XA-55-27B-B C-2, "UNIT 1 CCS SURGE TANK LEVEL ABNORMAL"**
  D-2, "UNIT 1 CCS CURGE TK LVL LO AUTO MAKEUP INITIATED"
- **0-XA-55-27B-D C-2, "UNIT 2 CCS SURGE TANK LEVEL ABNORMAL"**
  D-2, "UNIT 1 CCS CURGE TK LVL LO AUTO MAKEUP INITIATED"

Indications

1-LI-70-99A CCS SURGE TK A OUTLET LEVEL ("B" Header) indicates a lowering level
1-LI-70-63A CCS SURGE TK A INLET LEVEL ("A" Header) indicates a lowering level
2-LI-70-99A CCS SURGE TK A OUTLET LEVEL indicates a lowering level
2-LI-70-63A CCS SURGE TK A INLET LEVEL indicates a lowering level

Significant Resultant Alarms/Indications:

Annunciator:

- **1-XA-55-15 D-3, "TURB AUX OR REAC BLDG FLOODED"**
- **E-3, "LS-59-180A/B DEM WTR AND CASK DECON SYS ABN CONDITION"**

T + 35	BOP	Respond to 0-M-27 alarms in accordance with Alarm Response Procedures

Evaluator Note: 0-M-27 Panel alarms from **both units** will actuate due to the common Component Cooling Water System operating alignment. If the BOP responds to **U2** surge tank level and make-up alarms, expected make-up to the **U2** surge tank is operating as expected. Prompts to be provided by the Simulator operator if contacted for **U2** indications not available on Simulator Panel 0-M-27.

	BOP	**From 0-AR-M27B-B C-2, BOP will inform SRO:** **[3] IF** surge tank level is low, **THEN** **[a] DISPATCH** operator to investigate problem.
	SRO	**[b] IF** sufficient level cannot be maintained, **THEN** **GO TO** AOP-M.03, *Loss of Component Cooling Water.*
	BOP	**From 0-AR-M27B-B D-2, BOP will inform SRO:** **[1] CHECK** surge tank level by observing **[1-LI-70-63A]**.
	BOP	**[2] VERIFY** 1-LCV-70-63 **OPEN**.

Op Test No.: NRC 2010302 Scenario # 1 Event # 3 Page 19 of 53

Event Description: Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Evaluator Note: BOP identifies U1 make-up valve 1-FCV-70-63 failed to open automatically (GREEN light lit, RED light dark), notifies SRO and opens valve using handswitch 1-HS-70-63 at 0-M-27B.</td></tr>
<tr><td colspan="3">Evaluator Note: SRO/BOP identifies CCS Surge Tank level stabilizing/level returning to normal; determines make-up controlled to maintain level.
Refer to Appendix G for CCS Surge Tank Level Switch Setpoints following this event guide.</td></tr>
<tr><td></td><td>CREW</td><td>[3] DISPATCH operator for local inspection to determine problem.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO</td><td>[4] VERIFY proper valve alignment in accordance with 1-SO-70-1, <i>Component Cooling Water System</i> Train A, and 0-SO-70-1 Component Cooling Water System Train B.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP</td><td>[5] MONITOR level in both surge tanks to determine seal leakage return problems.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>[6] MONITOR level increase in pocket sump for possible CCS leak inside containment.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO/BOP</td><td>[7] IF sufficient level cannot be maintained, THEN GO TO AOP-M.03, <i>Loss of Component Cooling Water</i> for emergency makeup instructions. [C.1]</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Evaluator Note: SRO/Crew may go to AOP-M.03, <i>Loss of Component Cooling Water;</i> Section 2.4 is applicable. Since the leak is within the capacity of make-up water flow, the crew needs to dispatch AUOs to make up to the DI Water System to ensure make-up inventory is available for the CCS System</td></tr>
<tr><td></td><td>US</td><td>US may use or refer to AOP-M-03, <i>Loss of Component Cooling Water;</i> Section 2.4 Train B CCS Header Failure; Steps 1-4 are adequate to address this event. Based on indications of 1-LI-70-99A, CCS Surge Tank A Outlet ("B" Header) is lowering.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>CAUTION:</td><td>If any Containment Spray Pump is running with NO CCS cooling, spray pump may experience bearing failure after 10 minutes.</td></tr>
</table>

Op Test No.:	NRC 2010302	Scenario #	1	Event #	3	Page	20 of 53
Event Description:	Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically						

Time	Position	Applicant's Actions or Behavior
	BOP	1. **DISPATCH** operators with radios to Auxiliary Building to LOCATE failure and PERFORM valve manipulations.
	BOP	2. **DISPATCH** an operator with radio to perform Appendix B, Operation of App. R Valves Required by Section 2.4.
	SRO/BOP	3. **CHECK** ERCW flows NORMAL for plant conditions: ERCW Flows are normal- crew moves on
	NOTE:	In the event of a "B" train line break the surge tank baffle prevents the "A" train from draining to less than 57% indicated level.
	NOTE:	Appendix G lists expected responses to various CCS surge tank levels.
	SRO/BOP	4. **MONITOR** Train B CCS surge tank level between 65% and 85%. • 1(2)-LI-70-99A, Unit 1(2) B CCS Surge Tank Level. ***(RNO Required)***
	SRO/BOP	**RNO:** **IF** CCS surge tank level is less than 64%, **THEN ENSURE** surge tank auto makeup starts.
	BOP	**IF** necessary to locally initiate surge tank makeup, **THEN DISPATCH** operator to perform the following: • Manually make up from demin water, **OR** • **ALIGN** ERCW supply **USING** Appendix E, Aligning ERCW Emergency Makeup. **[C.1]**
	NOTE:	Pressure range provided is expected value based on one Train B CCS pump in service. Plant conditions may cause values to be outside the expected range.
	BOP	5. **MONITOR** the following: • Train B CCS Surge Tank levels greater than 20%. • 0B1/0B2 CCS HX inlet pressure NORMAL (between 90 and 118 psig). ***(RNO Required)***

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Event Description: Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior
Evaluator Note: Train B CCS Pump cavitation is not expected if the crew initiates make-up and isolates the leak per the following step RNO.		
		RNO: **IF** any Train B CCS pump is cavitating **OR** has lost suction, **THEN STOP** affected pump.
		IF any of the following conditions exists:
	BOP	• loss of surge tank level is imminent **OR** • Train B header break is indicated which requires isolation **OR** • Train B CCS flow has been lost,
	BOP	**THEN PERFORM** the following: a. **STOP** and **LOCK OUT** Train B pumps: • CCS Pump currently aligned to Train B (C-S, 1B-B, or 2B-B) • 1B-B Containment Spray Pump • 2B-B Containment Spray Pump
	BOP	b. **CLOSE** Train B ESF Header Isol Valves: • 0-FCV-70-12, 0B1/0B2 HX Outlet [Rx MOV Bd 1B2-B Compt. 12B] • 1-FCV-70-75, RHR HX B Return Isol [Rx MOV Bd 1B2-B Compt. 14B] • 2-FCV-70-75, RHR HX B Return Isol [Rx MOV Bd 2B2-B Compt. 14B]
	SRO	c. **IF** in Mode 4, 5, or 6, **THEN… N/A**
	NOTE 1: When Train B CCS is out of service, the associated CCPs, SI Pumps, and RHR Pumps are INOPERABLE for ECCS purposes due to not being able to fulfill their design function for sump recirculation.	
	NOTE 2: When CCS is out of service to mechanical seal HXs, the affected CCPs, SI Pumps, and RHR Pumps have been evaluated to be AVAILABLE. These pumps can run indefinitely without CCS cooling water to mechanical seal HXs. **[C.4]**	

Op Test No.: NRC 2010302 Scenario # 1 Event # 3 Page 22 of 53

Event Description: Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior
	SRO	6. **EVALUATE** Tech Specs and EPIP-1 **USING** Appendix H.
		- 3/4.5.2 ECCS – OPERATING 3.5.2- 2 ECCS trains shall be OPERABLE. (TS NOTES 1&2 MODE 3 applicable…N/A) ACTION a.: w/ 1 or more trains inoperable and w/ at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available, restore to OPERABLE status w/i 72 hrs or HT STBY w/i next 6 hrs & HT SHDN w/i following 6 hrs.
		- 3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS 3.6.2.1- 2 independent containment spray subsystems shall be OPERABLE with each subsystem comprised of: a. A Containment Spray train with: 1. One OPERABLE Containment Spray pump. 2. One OPERABLE Containment Spray heat exchanger. 3. An OPERABLE Containment Spray pump flow path capable of taking suction from the refueling water storage tank and transferring suction to the containment sump W/ 1 CSS subsystem inoperable, restore to OPERABLE w/i 72 hrs or HT STBY w/i next 6 hrs; restore inoperable subsystem to OPERABLE w/i next 48 hrs or CLD SHDN w/i next 30 hrs.
		- 3/4.7.3 COMPONENT COOLING WATER SYSTEM 3.7.3- 2 independent component cooling water loops shall be OPERABLE. W/ 1 CCS water loop OPERABLE, restore 2 OPERABLE w/i 72 hrs or HT STBY w/i 6 hrs & CLD SHDN w/i following 30 hrs.
	BOP	7. **ENSURE** all breakers are reopened **USING** Appendix B, Operation of App. R Valves Required by Section 2.4.
	SRO	8. **NOTIFY** SM to evaluate OPDP-9, Emergent Issue Response.
	CREW	9. **INITIATE** Maintenance as required.
	SRO	10. **GO TO** appropriate plant procedure
		END OF SECTION
Evaluator Note: SRO/BOP determines CCS Surge Tank manual make-up is adequate and will be required to maintain tank level (for the remainder of the scenario).		
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically

Op Test No.:	NRC 2010302	Scenario #	1	Event #	3	Page	23 of 53
Event Description:	Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically						

Time	Position	Applicant's Actions or Behavior
		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 CCS Surge Tank level controlled, leak isolated and Tech Specs identified.

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Event Description: Component Cooling Line Break (within make-up capacity) 1-FCV-70-63 fails to open automatically

SQN	**LOSS OF COMPONENT COOLING WATER**	**AOP-M.03** **Rev. 12**

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APPENDIX G

CCS SURGE TANK LEVEL SWITCH SETPOINTS

TANK LEVEL (INCHES)	TANK LEVEL (PERCENT)	EXPECTED RESPONSE
124"	100%	NONE (Upper tap)
105"	85%	LS-70-99A/B ANN. "Surge Tank Level Abnormal" (high level)
90"	73%	LS-70-63B/A or LS-70-63C/B- Closes Demin. Auto Make Up Valve
105" to 79"	85% to 64%	Normal Operating Range
79"	64%	LS-70-63D Ann. "Surge Tank Level Low Auto Makeup Initiated" LS-70-63A/B or LS-70-63CA Open Demin. Auto Makeup Valve LCV-70-63
75"	61%	LS-70-99B/A ANN. "Surge Tank Level Abnormal" (low level)
71"	57%	NONE (TOP OF BAFFLE)
0"	0%	NONE (LOWER TAP)

Op Test No.:	NRC 2010302	Scenario #	1	Event #	4	Page	25 of 53
Event Description:	#2 RCP #2 Seal Failure						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 4		
Alarms/Indications available: **1-M-5** **Annunciator:** • **1-XA-55-5B A-3, "FS-62-10 REAC COOL PMPS SEAL LEAKOFF LOW FLOW"** • **B-2, "LS-62-19A REAC COOL PMP 2 STANDPIPE LVL HIGH-LOW"** **Indication:** • **1-FR-62-23, "RCP SEAL LEAKOFF-LOW RANGE" trend indicates >0.9 gpm** • **1-FR-62-24 "RCP SEAL LEAKOFF-LOW RANGE" trend indicates ≈1-2 gpm**		
T = 35	CREW	Respond in accordance with Alarm Response Procedures
	RO	Refer to ARP 1-AR-M5B A-3, verifies: • leakoff and #1 Seal ΔP less than 275 psid, • #1 Seal return isolation valve open • Acknowledges MODE 1 or 2 operation and refers SRO to AOP-R.04 **AND** continues ARP review.
	RO	Refer to ARP 1-AR-M5B B-2, verifies **Corrective Actions [1]** not applicable:
		[1] **IF** window 3 (A-3), REAC COOL PMPS SEAL LEAKOFF LOW FLOW is in alarm state in conjunction with this alarm (REAC COOL PMP STANDPIPE LVL HIGH-LOW), **THEN GO TO** window 3 (A-3) for Corrective Actions.
Evaluator Note: RO determines #2 seal leakoff is high; #1 & 3 normal and continues with ARP (following).		
	NOTE 1	The Hi-Low alarm can be determined by making up to the RCP standpipe. If the alarm does not clear, then it can be assumed the level is high or the level switch has failed. If the alarm clears, then it can be assumed the level was low.
	NOTE 2	A High RCP standpipe level in conjunction with reduced No. 1 Seal Leakoff flow and increasing flow to the RCDT is indicative of a failed No. 2 Seal.
	NOTE 3	Low standpipe level with increased flow to the Cntmt Fl & Eq Sump is indicative of a failed No. 3 seal.
	RO	[2] **ATTEMPT** to clear alarm by performing the following:
		[a] **OPEN [1-FCV-81-14]** RCP 2 Standpipe Makeup Water.
		[b] **IF** alarm clears, **THEN CONTINUE** standpipe fill for ~15 seconds OR until high alarm is actuated **AND** **CLOSE [1-FCV-81-14]** RCP 2 Standpipe Makeup Water.

Time	Position	Applicant's Actions or Behavior
	RO	**[c] IF** alarm does not clear, **THEN CLOSE [1-FCV-81-14]** RCP 2 Standpipe Makeup Water after ~3-4 minutes.
	RO	**[3] CHECK [1-FR-62-24]**, RCP Seal Leakoff High Range, to determine if any changes in seal return flow
		RO checks, determines no change in seal leakage rate
	RO	**[4] NOTIFY** Radwaste to **MONITOR** RCDT parameters (level, temperature and pressure).
	RO	**[5] IF** RCP Standpipe Level Alarm fails to clear (high standpipe level) OR clears and reoccurs (low standpipe level), **THEN GO TO** AOP-R.04, *Reactor Coolant Pump Malfunctions.*
	SRO	Determines AOP-R.04, Reactor Coolant Pump Malfunctions Section 2.4, "#2 Seal Leakoff High Flow (high RCP standpipe level) on ANY RCP" entry is appropriate
AOP-R.04, Reactor Coolant Pump Malfunctions **Section 2.4, "#2 Seal Leakoff High Flow (high RCP standpipe level) on ANY RCP"**		
	RO	1. **EVALUATE** RCP standpipe alarms:
		a. **CHECK** RCP standpipe level alarm(s) LIT [M-5B, window A-2, B-2, C-2, D-2].
	CREW	b. **MONITOR** RCDT parameters at Radwaste Panel [Aux Bldg, el. 669']:
		• Level, LI-77-1 • Pressure, PI-77-2 • Temperature, TI-77-21

Op Test No.:	NRC 2010302	Scenario #	1	Event #	4	Page	27 of 53
Event Description:	#2 RCP #2 Seal Failure						

Time	Position	Applicant's Actions or Behavior
	RO	c. **FILL** affected RCP standpipe **USING** AR-M-5B, Annunciator Response: RO reviews RCP 2 [window B-2] ARP; may/may not re-perform.

Evaluator Note: Appendix A, RCDT Level Rate-of-Change follows this event guide

	RO	2. **MONITOR** #2 seal INTACT on affected RCP:
		• **VERIFY** #2 seal leakoff less than or equal to 0.5 gpm **USING** Appendix A, RCDT Level Rate-of-Change. ***(RNO Required)***
		• **VERIFY** RCP vibration is within limits of annunciator response 1-AR-M5-A (window D-3) VIBRATION & LOOSE PARTS MONITORING ALM. ***(RNO NOT Required)***
		RNO: **PERFORM** the following within 8 hours:
		a. **PERFORM** normal plant shutdown **USING** appropriate plant procedure.

Evaluator Notes: 0-GO-5 Section 5.3, "Power Reduction From 100% to 30%" follows this event guide.

Operator responsible for performing the remainder of AOP-R.04 will perform RNO Step b. below as directed by the SRO following reactor shutdown (0-GO-5 directs a manually reactor trip at ~20%).

The remainder of AOP-R.04 will be performed in the single-performer mode as defined in EPM-4, User's Guide.

	RO	b. **WHEN** reactor is shutdown or tripped, **THEN PERFORM** the following:
		1) **STOP** and **LOCK OUT** affected RCP
		2) **PULL TO DEFEAT** affected loop ΔT and T-avg: • XS-68-2D (ΔT) • XS-68-2M (T-avg)

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Event Description: #2 RCP #2 Seal Failure

Time	Position	Applicant's Actions or Behavior
	SRO	3. **CONSULT** Engineering:
		a. **NOTIFY** Engineering to provide recommendations.
		b. **EVALUATE** need to consult with Westinghouse for continued RCP operation.

Evaluator Note: Following the reactor shutdown, as directed by the SRO the operator responsible for performing Step 4 RNO from AOP-R.04 Section 2.4 will complete RNO Step b.

Time	Position	Applicant's Actions or Behavior
	RO	4. **CHECK** RCPs 1 and 2 RUNNING.
	RO	**RNO:** **CLOSE** affected loop's pressurizer spray valve. RO takes 1-PIC-68-340B, LOOP 2 PZR SPRAY CONTROL toggle switch to MANUAL and CLOSE
		5. **EVALUATE** EPIP-1, Emergency Plan Initiating Conditions Matrix.
		6. **EVALUATE** the following Tech Specs for applicability: • 3.4.6.2, RCS Operational Leakage ACTION b.: w/ any RCS leakage >the above limits, excluding PRESSURE BOUNDARY LEAKAGE or primary-to-secondary leakage, reduce w/i limits w/i 4 hrs or HT STBY w/i next 6 hrs & CLD SHDN w/i following 30 hrs.
		7. **GO TO** appropriate plant procedure.

Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.

Time	Position	Applicant's Actions or Behavior
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Tech Specs are addressed and the crew determines a plant shutdown is required.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	5	Page	29 of 53
Event Description:	H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 5		
Lead Evaluator Note: If crew chooses to Rx Trip vs. MT, **insert Event 6 immediately** following the Rx Trip.		
Evaluator Note: Following AOP-S.06 MT trip and power stabilization, the crew should enter AOP-S.05, Steam or Feedwater Leak. It starts Event Guide 6.		
Alarms/Indications available: **Multiple ICS H2 Cooler Outlet Gas Temperature Alarms** **Annunciators:** **1-M-1** • **1-XA-55-1A A-1, "GEN STATOR TEMPERATURE HIGH"** **B-4, "GEN STATOR COOL SYS FAILURE"** **Indications:** **1-M-2** • **Indicator 1-TI-35-76 "GENERATOR H2 TEMP" trending to top of scale (indicator scale: 50-150°F)**		
T = 65	BOP	Respond to ICS alarm, HYDROGEN COOLER OUTLET GAS TEMP (2 monitoring points) or MAIN GENERATOR window, TEMP's FOR HYDROGEN CLR
	BOP	Transfer 1-TIC-24-48, GENERATOR H2 COOLER REMP CONTROLLER, to MANUAL; manually control H2 cooling water flow to restore H2 temperature to normal (95-115°F)
	CREW	Respond using ARPs 1-AR-M1-A, A-1, B-4, that direct entry into AOP-S.06, Turbine Trip, Section 2.0 for the failure. If the unit is not reduced to <15% power within 45 seconds, an automatic MT trip will occur.
Evaluator Note: **The crew may respond to a H2 Cooler temperature alarm from ICS & discover the MG H2 TCV not responding in the AUTO mode. The BOP places controller 1-TIC-24-48 in manual to restore MG H2 temperature.**		
1-AR-M1-A A-1, "GEN STATOR TEMPERATURE HIGH"		
	NOTE: The applicable computer points may be viewed by typing [**show60 STATALM**]. The 'U' points are the delta-T's between the inlet and each applicable outlet.	
	BOP	**[1] CHECK** Plant computer to **DETERMINE** Thermocouple in alarm state or if instrument failure has occurred.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	5	Page	30 of 53
Event Description:	H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip						

Time	Position	Applicant's Actions or Behavior
	NOTE: If alarm occurs and the Plant computer is inoperable THEN dispatch personnel to obtain TC temperatures locally (temporary instrumentation connected to local terminal board) in accordance with 0-SO-35-4 *Monitoring Generator Parameters*	
	BOP	**[2] MONITOR** Stator Coil Temperatures in accordance with 0-SO-35-4, *Monitoring Generator Parameters.*
	BOP	**[3] IF** Generator Cooling Failure alarm (window B-4) is also present, **THEN REFER** to Alarm Response B-4 for Corrective Actions while continuing with this instruction.
Evaluator Note: Alarm Response B-4 Actions follow this ARP.		
	BOP	**[4] IF** ΔT is greater than or equal to 55°F (31°C) or Stator Outlet temperature is greater than or equal to 183°F (84°C), **THEN REDUCE** generator loading to limit Stator Temperature to less than alarm setpoint.
	BOP/ SRO	**[5] IF** Stator Outlet temperature …and Reactor Power is greater than 50% (P-9)… **N/A**
Evaluator Note: SRO/Crew decides AOP-S.06, Turbine Trip is appropriate; it follows this portion of event guide. AOP-S.06 follows this.		
	BOP	**[6] IF** Stator Outlet temperature is greater than or equal to 192°F(89°C). and Reactor Power is less than 50% (P-9), **THEN TRIP** turbine and **GO TO** AOP-S.06, *Turbine Trip.*
	BOP	**[7] IF** SCW temps are greater than 50 deg. C (122 deg. F) AND 1- TCV-24-52 is NOT controlling properly, **THEN:**
		[a] OPEN [1-VLV-24-541] TCV Bypass as required to maintain SCW temperatures 35 - 50 deg. C (86 - 122 deg. F) **[b] PERFORM** 0-SO-35-4 *Monitoring Generator Parameters* to **BYPASS** and **ISOLATE** 1-TCV-24-52
1-AR-M1-A B-4, "**GEN STATOR COOL SYS FAILURE**"		
	CAUTION If Unit is greater than 15% power then Unit Trip will occur after 45-second time delay.	
	SRO/ Crew	**[1] IF** possible **REDUCE** load to less than 15% within 45 seconds in accordance with appropriate procedure: E-0, *Reactor Trip or Safety Injection* AOP-C.03, *Rapid Shutdown or Rapid Load Reduction* AOP-S.06, *Turbine Trip*.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	5	Page	31 of 53
Event Description:	H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip						

Time	Position	Applicant's Actions or Behavior
	BOP	[2] **DISPATCH** personnel to Stator Cooling System.
		[a] **ENSURE** one Stator Cooling Water Pump **RUNNING**. [b] **EVALUATE** Start of Reserve Stator Cooling Water Pump in accordance with 0-SO-35-2, *Stator Cooling Water System*. [c] **ENSURE** Raw Cooling Water Aligned to Heat Exchangers in accordance with 0-SO-35-2, *Stator Cooling Water System*.
	BOP	[3] **CHECK** Stator Cooling System Operation within normal operating parameters of 0-SO-35-2.
	BOP	[4] **IF** Unit is greater than 15% power **AND** alarm has been lit for greater than 45 seconds, **THEN ENSURE** Unit Trip.
Evaluator Note: Following AOP-S.06 MT trip and power stabilization, the crew should enter AOP-S.05, Steam or Feedwater Leak. It starts Event Guide 6.		
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 the crew determines a plant shutdown is required.		

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Event Description: H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip

Time	Position	Applicant's Actions or Behavior
		AOP-S.06, Turbine Trip Below P-9 (50% Power)
	Crew	Diagnose conditions; determine Turbine Trip caused by Stator Cooling Water problem. SRO directs AOP-S.06 implementation.
	BOP	1. **VERIFY** turbine TRIPPED: • **CHECK** turbine stop valves CLOSED.
	RO	2. **CHECK** reactor power less than 20%.
	SRO/RO	3. **WHEN** reactor power is less than 20%, **THEN ENSURE** rod control in MANUAL.
	RO	**RNO:** **ENSURE** control rods inserting in AUTO or MANUAL to reduce Tave and power.
	BOP	4. **CHECK** main generator PCBs OPEN after 30 second time delay [M-1].
	BOP	5. **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).
	CAUTION	Excessive feedwater flow may cause an ESF actuation due to rapidly decreasing steam generator pressure.
	BOP	6. **CHECK** S/G narrow range levels STABLE at or trending to program value.

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Event Description: H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip

Time	Position	Applicant's Actions or Behavior
AOP-S.06, Turbine Trip Below P-9 (50% Power)		
	RO	7. **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.
	RO/BOP	8. **ANNOUNCE** turbine trip **USING** PA system.
	RO	9. **MONITOR** pressurizer level control
		a. **CHECK** pressurizer level greater than 17%.
		b. **VERIFY** letdown IN SERVICE
		c. **CHECK** pressurizer level trending to program level.
	RO	10. **MONITOR** Pressurizer Pressure control:
		• Pressurizer pressure stable at or trending to 2235 psig (normal range 2210 psig to 2260 psig)
	NOTE: Failing open the # 3 heater drain tank bypass LCV-6-105A and 105B may prevent heater string isolation.	
	BOP	11. **IF** #3 Heater Drain Tank Pumps running, **THEN PERFORM** the following:
		a. **STOP** all #3 Heater Drain Tank Pumps and **PLACE** in PULL-TO-LOCK position.
		b. **DISPATCH** operator to perform Appendix A to fail open #3 Heater Drain Tank bypass valves.
		c. **CLOSE** the following #3 Heater Drain Tank pump discharge valves:
		• FCV-6-108
		• FCV-6-109
		• FCV-6-110

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Event Description: H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip

Time	Position	Applicant's Actions or Behavior
		AOP-S.06, Turbine Trip Below P-9 (50% Power)
	BOP	12. **ENSURE** moisture separator reheaters ISOLATED:
		a. **DEPRESS** RESET on MSR control panel XX-47-3000.
		b. **CLOSE** HP steam isolation valves to MSRs and **VERIFY** status on panel XX-1-145:
		• FCV-1-141
		• FCV-1-241
		• FCV-1-135
		• FCV-1-235
		• FCV-1-143
		• FCV-1-243
		• FCV-1-137
		• FCV-1-237
		• FCV-1-145
		• FCV-1-245
		• FCV-1-139
		• FCV-1-239
		c. **CLOSE** MSR Operating Vents.
		d. **OPEN** MSR Startup Vents.
	NOTE: 0-GO-4 requires Reactor power at approximately 13-15% for Turbine Roll.	
	SRO	13. **EVALUATE** Reactor power reduction to less than 15%.
		14. **IF** Reactor Power drops by greater than 15% in one hour, **THEN NOTIFY** Chemistry to initiate conditional portions of SI-53, SI-407.2 and 0-SI-CEM-000-415.
	BOP	15. **SHUT DOWN** unnecessary plant equipment **USING** 0-GO-12, Realignment of Secondary Equipment Following Reactor/Turbine Trip.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	5	Page	35 of 53
Event Description:	H2 Cooler/Stator Cooling Loss- MT Trip, No Rx Trip						

Time	Position	Applicant's Actions or Behavior
AOP-S.06, Turbine Trip Below P-9 (50% Power)		
	CREW	16. **CHECK** the following to determine cause of trip:
		a. Electrical trip:
		• Electrical Control Board
		• Relay targets [relay room]
	CREW	b. Fault inside generator:
		• Generator H2 pressure
		• Generator Core Condition Monitor
	SRO	17. **IF** Turbine to be returned to service, **THEN PERFORM** one of the following:
		• **GO TO** 0-GO-4, Power Ascension from less than 5% Reactor Power to 30% Reactor Power. OR
	SRO	• **GO TO** 0-GO-11, Turbine Shutdown Without Reactor Shutdown.
	CAUTION:	Reactor operation at low power levels for extended periods may challenge reactivity control due to xenon changes.
	RO	18. **CHECK** Reactor power greater than 5%.
	SRO	19. **IF** Reactor to be shutdown **OR** power reduced to less than 15%, **THEN GO TO** 0-GO-6, Power Reduction from 30% Reactor Power to Hot Standby.
		END OF SECTION

Evaluator Note: SRO/CREW may conduct a brief at this time and should return/insure reactor power is stable per AOP-S.06, Turbine Trip Below P-9 (50% Power).

Evaluator Note: Following AOP-S.06 MT trip and power stabilization, the crew should enter AOP-S.05, Steam or Feedwater Leak. It starts Event Guide 6.

Lead Examiner may cue next event when the CREW has stabilized plant power.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	6	Page	36 of 53
Event Description:	MS Safety Vlvs lift 1 per SG on all SGs						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 6		
Lead Evaluator Note: If crew chooses to Rx Trip vs. MT, **insert Event 6 immediately** following the Rx Trip.		

Indications available:

Indicators:

1-M-4

- **1-FI-1-3A, 3B, SG-1 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-FI-1-10A, 10B, SG-2 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-FI-1-21A, 21B, SG-3 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-FI-1-28A, 28B, SG-4 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-XI-92-5005C, 5006C, 5007C, 5008C, RX POWER CH-I-IV N-41 – 44, NOS Power Range indicators: Increasing reactor power**
- **1-XR-92-5001, NUCLEAR POWER NR-45: Increasing trends on power ranges selected.**

Indicators:

1-M-5

- **1-TI-68-2E, 25E, 44E, 67E LOOPs 1-4 TAVG Decreasing temperature indications (w/ no rod motion)**
- **1-TR-68-2B, RCS/TURBINE TEMP Recorder trending away from programmed value**

Annunicators:

1-M-5

- **1-AR-M5A A-6, "TS-68-2M/N RC LOOPS T AVG /AUCT T AVG DEVN HIGH-LOW"**

1-M-6

- **1-AR-M6B A-7, "FS-3-35B STM GEN LOOP 1 STEAMFEEDWATER FLOW MISMATCH"**
- **1-AR-M6B B-7, "FS-3-48B STM GEN LOOP 2 STEAMFEEDWATER FLOW MISMATCH"**
- **1-AR-M6B C-7, "FS-3-90B STM GEN LOOP 3 STEAMFEEDWATER FLOW MISMATCH"**
- **1-AR-M6B D-7, "FS-3-103B STM GEN LOOP 4 STEAMFEEDWATER FLOW MISMATCH**

Significant Resultant Alarms/Indications:

- **Annunciator 1-XA-55-6A Window E-1: TS-68-2J REACTOR COOLANT LOOPS LO LO TAVG**

Time	Position	Applicant's Actions or Behavior
T = 70	CREW	Refer to alarm response procedures and carries out the following actions:
Evaluator Note: If alarm 1-AR-M6-A E-2, TS-68-2J REACTOR COOLANT LOOPS LO LO TAVG actuates indicating an excessive cooldown, the crew may decide to manually trip the reactor.		
Evaluator Note: Personnel safety is not a concern with this steam leak location; the crew should monitor for worsening conditions but no personnel safety-based actions are required at this time.		
		AOP-S.05, Steam or Feedwater Leak
	Crew	Diagnose conditions; SRO directs AOP-S.05 implementation.
	Crew	1. **MONITOR** personnel safety:
		a. **IF** steam or feedwater lines need to be immediately isolated to protect personnel, **THEN PERFORM** the following:
	RO	1) **TRIP** the reactor.
	BOP	2) **IF** leak is on steam lines **OR** source is unknown, **THEN CLOSE** MSIVs.

Op Test No.: NRC 2010302 Scenario # 1 Event # 6 Page 37 of 53

Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
	BOP	3) **IF** leak is on feedwater lines **OR** source is unknown, **THEN PERFORM** the following:
		a) **TRIP** MFW pumps.
		b) **CLOSE** Feed Reg Valves.
	RO	4) **GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	2. **MONITOR** steam generator levels STABLE on program.
	BOP	3. **CHECK** the following:
		• S/G atmospheric relief valves CLOSED
		• steam dumps CLOSED.
	BOP	4. **CHECK** main turbine on line. ***(RNO required)***
		RNO a. is required: **MONITOR** the following actions: a. **IF** unit is in Mode 1 or 2 **AND** reactor power is rising due to uncontrolled cooldown, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.
		3) **GO TO** E-0, Reactor Trip or Safety Injection.
		END OF SECTION
	SRO	IF a reactor trip is directed, THEN GO TO E-0, *Reactor Trip or Safety Injection.*
	SRO	Direct Manual Rx Trip/MSIV closing
	SRO	Enter and Direct E-0 Immediate Operator Actions (IOAs)

LEAD EXAMINER: Crew will trip the reactor and transition to E-0 as previously stated.

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Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
E-0, *Reactor Trip or Safety Injection*		
Evaluator Note: Following IOA performance, prior to Steps 1-4 immediate action verification, RO/BOP surveys MCBs for any expected automatic system response that failed to occur. Upon discovery, they may take manual action(s) to align plant systems as expected for the event in progress. (Ref. EPM-4, Prudent Operator Actions)		
Annunicators/Indications as specified at Event 6 initiation		
	Note 1 Steps 1 through 4 are immediate action steps	
	Note 2 This procedure has a foldout page	
	RO	1. VERIFY reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
	BOP	2. VERIFY turbine TRIPPED: • Turbine stop valves CLOSED.
	BOP	3. VERIFY at least one train of shutdown boards ENERGIZED. • Attempt to restore power to at least ONE train of shutdown boards • Place DG 1A-A control switch in START • Verify Train A Shutdown Boards ENERGIZED
	RO	4. DETERMINE if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated) ***(RNO Required)***
	RO/BOP	**RNO:** DETERMINE if SI required: a. IF any of the following conditions exists: • S/G pressure less than 600 psig, OR • RCS pressure less than 1870 psig, OR • Containment pressure greater than 1.5 psig, THEN ACTUATE SI.

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Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
E-0, *Reactor Trip or Safety Injection*		
Evaluator Note:		SRO/crew should exercise **FOLDOUT PAGE** **<u>EVENT DIAGNOSTICS</u>** for SG depressurization during performance of the prudent operator actions (POAs) Correct POAs implemented would then result in ALL MSIVs closed and SI actuated.
FOLDOUT PAGE		
		<u>RCP TRIP CRITERIA</u> – N/A
		<u>EVENT DIAGNOSTICS</u>
		• **IF** any S/G pressure is dropping uncontrolled, **THEN PERFORM** the following:
	RO/BOP	a. **CLOSE** MSIVs and MSIV bypass valves
		b. **IF** any S/G pressure continues to drop uncontrolled, **THEN PERFORM** the following:
	RO	1) **ENSURE** SI actuated.
		2) **IF** at least one S/G is intact (S/G pressure controlled or rising), **THEN....Continuing Actions N/A**
Evaluator Note:		Actions for ES-0.5 are contained in attachment at back of scenario guide. Following the reactor shutdown, the operator responsible for performing AOP-R.04 Section 2.4 Step 4 RNO Step b as directed.
	RO	b. **WHEN** reactor is shutdown or tripped, **THEN PERFORM** the following:
		1) **STOP** and **LOCK OUT** affected RCP
		2) **PULL TO DEFEAT** affected loop ΔT and T-avg: • XS-68-2D (ΔT) • XS-68-2M (T-avg)
	BOP	5. PERFORM ES-0.5, Equipment Verifications WHILE continuing in this procedure.
	RO	6. 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 all S/Gs.

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Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
		E-0, *Reactor Trip or Safety Injection*
		(Heat Sink is available from AFW:>440 gpm available.)
	RO	7. 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
	RO	8. 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
	RO	9. MONITOR RCS temperatures: • IF any RCP running, THEN CHECK T-avg stable at or trending between 547°F and °F. OR • IF RCPs stopped, THEN CHECK T-cold stable or trending to between 547°F and 552°F.
	RO	10. 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.

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Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
		E-0, *Reactor Trip or Safety Injection*
	CREW	11. DETERMINE 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 Required)***
	SRO	**RNO:** **PERFORM** the following:
Evaluator Note:		at Step 11.a, **MONITOR** status trees, the crew will implement status tree monitoring via SPDS. When a RED or ORANGE path status tree is observed, the SRO will designate one of the Board operators (typically the BOP) to verify status tree conditions using **1-FR-0, UNIT 1 STATUS TREES**. Once verified, the SRO should direct the crew to transition to the appropriate RED and/or ORANGE path procedure(s).
	Crew	a. **MONITOR** status trees.
	SRO	b. **GO TO** E-2, Faulted Steam Generator Isolation.
		Crew transitions to E-2**,** Faulted Steam Generator Isolation.

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Event Description:	MS Safety Vlvs lift 1 per SG on all SGs								

E-2, Faulted Steam Generator Isolation		
	CAUTION: Unisolating a faulted S/G or secondary break should NOT be considered UNLESS needed for RCS cooldown.	
	RO	1. **CHECK** MSIVs and MSIV bypass valves CLOSED.
	RO	2. **CHECK** ANY S/G secondary pressure boundary INTACT: • Any S/G pressure CONTROLLED or RISING. ***(RNO required)***
		RNO: **IF** all S/G pressures dropping in an uncontrolled manner, **THEN GO TO** ECA-2.1, Uncontrolled Depressurization of All Steam Generators.
	SRO	Directs transition to ECA-2.1 Uncontrolled Depressurization of All Steam Generators
END OF TEXT		

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Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
ECA-2.1, Depressurization of All Steam Generators.		
	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.	
	NOTE: This procedure has a foldout page.	
		1. **CHECK** secondary pressure boundary:
		a. **CHECK** the following:
		• MSIVs and MSIV bypass valves CLOSED
		• MFW regulating valves and reg bypass valves CLOSED
		• MFW isolation valves CLOSED
		• Atmospheric reliefs CLOSED
		• S/G blowdown valves CLOSED
		b. **CHECK** MD AFW pumps RUNNING.
		c. **CLOSE** TD AFW pump steam supply valve FCV-1-17 or FCV-1-18.
Critical Task:	Throttle AFW Flow to Multiple Faulted SGs in order to minimize RCS cooldown rate before a severe (orange-path) challenge develops to the PTS CST	
	NOTE Reducing total feed flow to less than 440 gpm, as directed in this procedure, does NOT require implementation of FR-H.1, Loss of Secondary Heat Sink, as long as a total feed flow capability of 440 gpm is available.	
	CREW	2. **CONTROL** feed flow to minimize RCS cooldown:
	RO	a. **CHECK** T-cold cooldown rate less than 100°F/hr. ***(RNO required)***
Critical Task	**BOP**	**RNO:** **a. REDUCE feed flow to 50 gpm to each S/G.**
	BOP	**OPEN** MD AFW pump recirc valves FCV-3-400 and FCV-3-401 as necessary to control flow.
	SRO	**GO TO** Substep 2.c (AER column).
	BOP	AER 2.c. **MONITOR** S/G narrow range levels greater than 10% [25% ADV]. ***(RNO required)***
	BOP	**RNO:** c. **MAINTAIN** feed flow to affected S/G(s) greater than or equal to 50 gpm UNTIL level greater than 10% [25% ADV].

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Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
	RO	d. **MONITOR** T-hot indications STABLE or DROPPING.
	SRO/ RO	3. **MAINTAIN** shutdown margin adequate:
		a. **NOTIFY** Chem Lab to sample RCS boron concentration.
		b. **CHECK** shutdown margin ADEQUATE **USING** 0-SI-NUC-000-038.0, Shutdown Margin.
	RO	4. **MONITOR** if RCPs should be stopped:
		a. **CHECK** if the following conditions exist:
		• RCS subcooling based on core exit T/Cs less than 40°F **AND**
		• RCS pressure less than 1250 psig **AND**
		• At least one CCP **OR** SI pump RUNNING.
		b. **STOP** RCPs.
		5. **CHECK** CST level greater than 5%.
	CAUTION: Any time a pressurizer PORV opens, there is a possibility that it may stick open.	
		6. **MONITOR** pressurizer PORVs and block valves:
		a. Power to block valves AVAILABLE
		b. Pressurizer PORVs CLOSED
		c. At least one block valve OPEN.
		7. **VERIFY** secondary radiation NORMAL:
		a. **CHECK** secondary radiation NORMAL **USING** Appendix A, Secondary Rad Monitors.
		b. **NOTIFY** Chem Lab to take periodic S/G activity samples.
		c. **WHEN** Chem Lab is ready to sample S/Gs, **THEN PERFORM** the following:
		1) **ENSURE** Phase A RESET.
		2) **ENSURE** FCV-15-43 Blowdown Flow Control valve CLOSED.

Op Test No.: NRC 2010302 Scenario # 1 Event # 6 Page 45 of 53

Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
		3) **OPEN** blowdown isolation valves.
		d. **NOTIFY** RADCON to survey main steamlines and S/G blowdown.
		e. **WHEN** S/G samples completed, **THEN CLOSE** blowdown isolation valves
		8. **DETERMINE** if RHR pumps should be stopped:
		a. **CHECK** RHR pump suction aligned to RWST.
		b. **CHECK** RCS pressure:
		1) Greater than 300 psig
		2) STABLE or RISING.
		c. **RESET** SI signal.
		d. **STOP** RHR pumps and **PLACE** in A-AUTO.
		e. **MONITOR** RCS pressure greater than 300 psig.
		9. **MONITOR** shutdown boards continuously energized.
		10. **MONITOR** if containment spray should be stopped:
		a. **CHECK** any containment spray pump RUNNING.
		b. **CHECK** containment pressure less than 2.0 psig.
		c. **CHECK** containment spray suction aligned to RWST.
		d. **RESET** Containment Spray.
		e. **STOP** containment spray pumps and **PLACE** in A-AUTO.
		f. **CLOSE** containment spray discharge valves:
		• FCV-72-39
		• FCV-72-2.
		11. **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.
		12. **CHECK** RWST level greater than 27%.

Op Test No.: NRC 2010302 Scenario # 1 Event # 6 Page 46 of 53

Event Description: MS Safety Vlvs lift 1 per SG on all SGs

Time	Position	Applicant's Actions or Behavior
		13. **DETERMINE** if CLAs should be isolated:
		a. **CHECK** RCS pressure less than 100 psig.
		b. **CHECK** power to CLA isolation valves AVAILABLE.
		c. **RESET** SI signal.
		d. **CLOSE** CLA isolation valves.
		14. **MONITOR** SI termination criteria:
		a. RCS subcooling based on core exit T/Cs greater than 40°F.
		b. RCS pressure STABLE or RISING.
		c. Pressurizer level greater than 10% [20% ADV].
	CAUTION: Steps 15 through 25 terminate SI. Transition to E-2, Faulted Steam Generator Isolation, via the Foldout Page is NOT appropriate UNTIL after completion of Step 25.	
Lead Examiner may terminate the scenario following completion of ECA-2.1, Step 14, SI termination determination.		

Op Test No.: NRC 2010302 Scenario # 1 Event # ES-0.5 Page 47 of 53

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken) to SRO.
	BOP	1. **VERIFY** D/Gs RUNNING.
	BOP	2. **VERIFY** D/G ERCW supply valves OPEN.
	BOP	3. **VERIFY** at least four ERCW pumps RUNNING
	BOP	4. **VERIFY** CCS pumps RUNNING
		• Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	5. **VERIFY** EGTS fans RUNNING.
	BOP	6. **VERIFY** generator breakers OPEN.
	Crew	7. **NOTIFY** at least two AUOs to report to MCR to be available for local actions.
	BOP	8. **VERIFY** AFW pumps RUNNING: a. MD AFW pumps b. TD AFW pump.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	ES-0.5	Page	48	of 53
Event Description:	Equipment verifications							

Time	Position	Applicant's Actions or Behavior
ES-0.5, EQUIPMENT VERIFICATIONS		
	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	9. 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	10. **VERIFY** MFW Isolation: a. MFW pumps TRIPPED b. **ENSURE** the following: • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	11. **MONITOR** ECCS operation:
		a. **VERIFY** ECCS pumps RUNNING: • CCPs: • RHR pumps • SI pumps
		b. **VERIFY** CCP flow through CCPIT.
		c. **CHECK** RCS pressure less than 1500 psig.
		d. **VERIFY** SI pump flow.
		e. **CHECK** RCS pressure less than 300 psig.
		f. **VERIFY** RHR pump flow.
	BOP	12. **VERIFY** ESF systems ALIGNED:
		a. Phase A ACTUATED: • PHASE A TRAIN A alarm LIT [M-6C, B5]. • PHASE A TRAIN B alarm LIT [M-6C, B6].

Op Test No.: NRC 2010302 Scenario # 1 Event # ES-0.5 Page 49 of 53

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		b. Cntmt Vent Isolation ACTUATED: • CNTMT VENT ISOLATION TRAIN A alarm LIT [M-6C, C5]. • CNTMT VENT ISOLATION TRAIN B alarm LIT [M-6C, C6].
		c. Status monitor panels: • 6C DARK • 6D DARK • 6E LIT OUTSIDE outlined area • 6H DARK • 6J LIT.
		d. Train A status panel 6K: • CNTMT VENT GREEN • PHASE A GREEN
		e. Train B status panel 6L: • CNTMT VENT GREEN • PHASE A GREEN
	BOP	13. **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.

Op Test No.: NRC 2010302 Scenario # 1 Event # ES-0.5 Page 50 of 53

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		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].
		d. **ENSURE** RCPs STOPPED.
		e. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN. • Panel 6L PHASE B GREEN.
		f. **WHEN** 10 minutes have elapsed, **THEN ENSURE** containment air return fans RUNNING.
		14. **MONITOR** if containment vacuum relief isolation valves should be closed:
		a. **CHECK** containment pressure greater than 1.5 psig.
		b. **CHECK** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48.
	BOP	15. **CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors (attached) • Appendix B, Containment Rad Monitors. (attached)
	BOP	16. **WHEN** directed by E-0, **THEN PERFORM** Appendix D, Hydrogen Mitigation Actions.

Op Test No.: NRC 2010302 Scenario # 1 Event # ES-0.5 Page 51 of 53

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		17. **CHECK** 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	18. **DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	19. **ENSURE** plant announcement has been made regarding Reactor Trip and SI.

Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken, i.e.: containment Spray operating discrepancies per ES-0.5 Step 13) to SRO.

END (ES-0.5, EQUIPMENT VERIFICATIONS)

Op Test No.: NRC 2010302 Scenario # 1 Event # ES-0.5 Page 52 of 53

Event Description: Equipment verifications

(ES-0.5, EQUIPMENT VERIFICATIONS)		
APPENDIX A **SECONDARY RAD MONITORS**		
	BOP	1. **CHECK** following rad monitors including available trends prior to isolation: • Condenser exhaust recorder RR-90-119 • S/G blowdown recorder RR-90-120 • Main steam line rad monitors • Post-Accident Main Steam Line rad recorder RR-90-268B points 3 (blue), 4 (violet), 5 (black), and 6 (brown). [M-31 (back of M-30)]
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.
END OF TEXT		

APPENDIX B **CONTAINMENT RAD MONITORS**		
	BOP	1. **CHECK** following rad monitors: • Upper containment high range rad monitors RM-90-271 and RM-90-272 NORMAL [M-30] • Lower containment high range rad monitors RM-90-273 and RM-90-274 NORMAL [M-30] • Containment rad recorders RR-90-112 and RR-90-106 NORMAL [M-12] (prior to isolation).
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.
END OF TEXT		

Op Test No.: NRC 2010302 Scenario # 1 Event # Critical Task(s) Page 53 of 53

Event Description: Critical Task Listing

Critical Tasks:	Critical Task Statement	Action Location	ESG pg #
1.	Throttle AFW Flow to Multiple Faulted SGs in order to minimize RCS cooldown rate before a severe (orange-path) challenge develops to the PTS CST Orange-path conditions: 1- All Tcold points dropped more than 100°f in <1 hour; 2- ALL RCS PRESSURE vs. T-COLD POINTS to the right of Limit A on Curve 1 3- All Tcold points <285°F. (to the left of T1)	ECA-2.1 Step 2.a.RNO	43

NRC 1009 ESG-1 Booth Instruction File

8/6/2010

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
Simulator IC	**IC-118** 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:** **<u>1009 NRC ESG-1</u>** • Place simulator in RUN. • Place OOS equipment in required position with tags. Clear alarms	**~42%, BOL ~150 MWD/MTU** **CB 'D' Rods @ 180 steps, all others @ 228 steps;** **[B] = 1350ppm; Ba Blender setting: 28%** **Xe/Sm @ *equilibrium*** ***<u>Console Operator actions: Place simulator in run and perform the following:</u>*** • **Allow the simulator to run before loading SCEN file.** • **Place the MODE 1 sign on 1-M-4** • **Place Train Week A sign** • **Set Ranges on Tave/Tref Recorder on 1-M-6 to ± 3 degrees for current conditions** *(System Menu/Strip Chart Assign… Tab through to fix)* • **1C Pzr Htrs energized**
MFs, RFs, ORs active when SCN file loaded:	***- none -***	
1.	**N/A**	**Normal Power Increase: perform 0-GO-5 Section 5.1 Step 23** *<u>Support staff:</u> as expected for power increase per 0-GO-5*
2.	**IMF CV06B f:1 k:2** **IMF CV01B f:1 d:300 k:2**	**1B-B CCP Aux LO Pump Actuates** **1B-B CCP Trip** *<u>1)- Support staff:</u> wait ~1 minutes, report as AB AUO some oil leaking from an oil supply line on 1B-B CCP, local oil pressure indication stable but lower than normal.* *<u>2)- Support staff:</u> CCP trip: report as AB AUO- pump motor is hot to the touch;* *If MCR AUO dispatched, wait ~ 1 minute, report breaker is tripped on Instantaneous over current.* *If SM notified, give no direction; ask: "what's your recommendation?"*
3.	**IMF CC20 f:1 k:3** **IMF CC14 f:32 k:3**	**1-FCV-70-63 fails to open automatically** **Component Cooling Line Break- C-S Pp Disch Hdr** (within make-up capacity) *<u>Support staff:</u> If requested, report **U2** make-up is in progress as expected.*
	IRF CCR15 f:1 k:13	**Demin Head Tank Make-up @ ~400 gpm** *<u>Support staff:</u> if dispatched to respond 1-AR-M15-B, E-3, wait 2 minutes insert k: 13 and report DI Head Tank make-up is in progress.*

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
When Appx B performance requested,	**IMF AN_OV_604 f:2 k:23**	1-XA-55-M6-E A-4, "*480V REAC MOV BD 1B1-B/1B2-B TRANSFER SWITCH IN AUX MODE*": Any mode selector switch on Reactor MOV Bd 1B1-B or 1B2-B in 'Auxiliary' position. *<u>Support staff:</u> When dispatched, wait 1 minute, insert k:23 and report as AUO, Appendix B valves transferred to 'AUXILIARY", standing by.* *<u>Support staff:</u> When directed by the MCR staff, insert k:33 to sequentially close specified valves; report as AUO valves are positioned to 'CLOSE'.* *<u>Support staff:</u> If requested, report as AB AUO water flow from CCS piping break subsiding.*
When MCR staff directs,	**IRF CCRV12 f:0 k:33** **IRF CCRV75 f:0 d:5 k:33** **IRF CCR2V75 f:0 d:10 k:33**	**Closes the following Appendix B Valves:** **1-FCV-70-12, CCS HX 0B1 and 0B2 Outlet** **1-FCV-70-75- U1 B-Trn to C-S Pump.** **2-FCV-70-75- U2 B-Trn to C-S Pump.**
INSTRUCTOR NOTE: delete AN_OV_604 when directed by the MCR staff to remove power from Appx. B Valves.		
		<u>Support staff:</u> If dispatched, wait ~2 minutes, report as the AB AUO, water on the floor around the CC Hxs on AB El. 714' and running down the stairs; location appears to be on the common inlet to the 0B1/0B2 CCS Hx. *If requested to check the Flood Mode Pnl, report LS-40-54, 55 @714'3" increasing;* *If requested to TB 685'local panel, report LS-59-180A/B Demin Water Storage Tank level low is the cause*
4.	**IMF CV18B f:10 r:30 k:4**	**#2 RCP #2 Seal Failure** *<u>Support staff:</u> respond as requested for normal plant shutdown per the GOs.*
5.	**IOR ZAITIC2448 f:1 k:5**	**Gen H2 Temp Hx Cooling Water Controller failure** *<u>Support staff:</u> if dispatched, TB AUO reports no apparent, visible cause for malf.*
5.a.	**IMF RW09 f:1 k:15** **IOR ZDITIC2448SW1 f:1 k:15** **IOR ZDITIC2448SW3 f:2 k:15**	**RCW to Stator Cooling & H2 Cooling Loss- MT Trip, No Rx Trip** **RCW to H2 Coolers fail** *<u>Support staff:</u> if requested, TB AUO reports 1-TCV-24-48 indicates closed; bypass jammed- will not open; local SCW temperature is increasing.*
6.	**IMF MS03A f:100 r:20 k:6** **IMF MS03B f:100 r:21 k:6** **IMF MS03C f:100 r:22 k:6** **IMF MS03D f:100 r:23 k:6**	**MS Safety Vlvs lift 1 per SG on all SGs** *<u>Support staff:</u> if requested, OS AUO, Security, etc. reports steam discharging from the roof of East & West Valve Vaults and is not a safety issue at this time.*
Termination Criteria: ECA-2.1, Step 14, SI termination determination.		

DELTA TIME (hrs)	REACTOF POWER (%)	POWER DEFECT (pcm)	ASSUMED ROD HT (steps)	INSERTED WORTH (pcm)	EXPECTEC XENON (pcm)	DELTA RHC BORON (pcm)	BORON CONC (ppm)	DELTA PPM (ppm)	ECOMMENI DILUTION (gal)	RECOMMENI BORATION (gal)	IODINE CONC (% eq)
0	42.0	740.7	180.0	-315.7	-2020.0	---	1350.0	---	---	---	42.0
1	46.5	810.9	184.0	-279.6	-2000.3	14.3	1347.7	-2.3	109	0	42.2
2	50.0	866.0	188.0	-245.9	-1974.2	-4.7	1348.5	0.7	0	9	42.8
3	50.0	865.8	188.0	-246.2	-1951.2	-22.8	1352.1	3.6	0	42	43.5
4	54.5	933.4	190.0	-226.2	-1929.6	26.0	1348.0	-4.1	197	0	44.4
5	59.0	1003.2	192.0	-206.7	-1905.0	25.7	1343.9	-4.1	196	0	45.6
6	63.5	1072.9	194.0	-187.7	-1880.2	26.0	1339.8	-4.1	199	0	47.1
7	68.0	1143.0	196.0	-169.3	-1857.6	29.0	1335.2	-4.6	222	0	49.0
8	72.5	1213.4	198.0	-151.7	-1838.6	33.9	1329.8	-5.4	261	0	51.1
9	75.0	1253.5	211.0	-64.7	-1826.8	-58.8	1339.1	9.3	0	108	53.3
10	75.0	1250.5	214.0	-47.1	-1827.0	-20.4	1342.3	3.2	0	37	55.4
11	75.0	1249.5	216.0	-36.1	-1838.9	-0.2	1342.4	0.0	0	0	57.4
12	75.0	1249.4	216.0	-36.0	-1859.2	20.3	1339.1	-3.2	155	0	59.1
13	75.0	1250.5	216.0	-36.0	-1885.2	27.0	1334.9	-4.3	207	0	60.7
14	75.0	1251.8	216.0	-36.0	-1914.9	31.0	1329.9	-4.9	239	0	62.1
15	75.0	1253.4	216.0	-36.0	-1946.7	33.3	1324.6	-5.3	257	0	63.3
16	75.0	1255.1	216.0	-35.9	-1979.4	34.4	1319.2	-5.5	267	0	64.5
17	75.0	1256.9	216.0	-35.9	-2012.2	34.5	1313.7	-5.5	269	0	65.5
18	75.0	1258.6	216.0	-35.8	-2044.4	33.9	1308.3	-5.4	265	0	66.5
19	75.0	1260.3	216.0	-35.8	-2075.6	32.9	1303.1	-5.2	258	0	67.3
20	75.0	1262.0	216.0	-35.8	-2105.5	31.5	1298.1	-5.0	248	0	68.1
								Total	3348	197	

150 MWD/MTU

6820 BAT ppm

Hold Tavg = Tref +/- 1.5F

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

Reason for Maneuver: Reactor/Plant restart following forced outage- 50% hold 75% hold
Date: Today
RxEng Name: J. Sidekick
Comments: none

SHIFT TURNOVER CHECKLIST Page 1. of 3 Today

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

Mode 1, 42% RTP
PSA Risk: Green
Grid Risk: Green

RCS Leakage ID .02 gpm, UNID .02 gpm

NRC phone Authentication Code

Until 0800 XXXX
After 0800 YYYY

Common Tech Spec Actions

- **None**

U-1 Tech Spec Actions

- **None**

Protected Equipment

- **None**

Shift Priorities

- Continue power increase to 100% RTP starting at 0-GO-5 Section 5.1 Step 23.
- Rx Engineering Spreadsheet for power increase is complete and ready for SRO verification.
- Use TI-40 Pre-Conditioned power level as applicable.
- Note: This restart is 24 hours following a shutdown that occurred after 5 days of continuous operation at 100% RTP. There are no fuel defects.

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

SHIFT TURNOVER CHECKLIST Page 2. of 3 Today

MAIN CONTROL ROOM (7690)

- **Train _A_ Week**

OUTSIDE (7666) [593-5214]

- **None**

AUXILIARY BUILDING (7775)

- **None**

TURBINE BUILDING (7771) (593-8455)

- **None**

SHIFT TURNOVER CHECKLIST Page 3. of 3 Today

Disabled Annunciators

PANEL	WINDOW	ANNUNCIATOR	WO / PER Number

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number

MCR WO LIST

ID And Noun Name	Panel	Problem Description	WO/PER Number

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1452** ppm Today		BA Controller Setpoint: **37.4%** *	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 189: **17** gallons of acid, **75** 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: **22**	Gallons of water: **94**	Rod Steps: **1**

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%	181 Steps on bank D	93 gallons
30%	161 Steps on bank D	291 gallons
50%	n/a	n/a

**

These values are approximations and not intended nor expected to be exact. The values may be superceded 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 three weeks from now.

Previous Shift Reactivity Manipulations

Remarks: Use Reactivity Manipulation spread sheet from Rx Eng.

Current Shift Estimated Reactivity Manipulations

Remarks: Use Reactivity Manipulation spread sheet from Rx Eng. Verify data using 0-SO-62-7.

Rx Power – 42%
MWD/MTU – 1000
Xenon – 1842 PCM Equilibrium
Samarium ~972 PCM

Last Dilution Complete ~1 hour ago.

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

Unit Supervisor: ______________________________
Name/Date

Operations Chemistry Information

Boron Results

Sample Point	Units	Boron	Date / Time	Goal	Limit
U1 RCS	ppm	1465	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	ppm	1.1	Today / Now	>1	>1
U2 RCS	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	115	Today / Now	68	Today / Now
15 gpd (30 min increase)	cpm	265	Today / Now	83	Today / Now
30 gpd leak equivalent	cpm	490	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	1165	Today / Now	455	Today / Now
150 gpd leak equivalent	cpm	2290	Today / Now	870	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cfm	40	Today / Now	40	Today / Now

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

TVA

Sequoyah Nuclear Plant

Unit 1 & 2

General Operating Instructions

0-GO-5

NORMAL POWER OPERATION

Revision 0065

Vfy eff, today's date

Quality Related

Level of Use: Continuous Use

Effective Date: 03-12-2010

Responsible Organization: OPS, Operations

Prepared By: W. T. Leary

Approved By: P. R. Simmons

Current Revision Description

Revised to address requirements overlooked in the initial issuance of the guidance for compliance with NERC Reliability Standards, VAR-002. These changes make no alteration to the operation of any equipment and are changes to required administrative notifications only. These changes are therefore minor editorial changes as defined in SPP-2.2.

PERFORMANCE OF THIS PROCEDURE IMPACTS REACTIVITY.

Table of Contents

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

This General Operating (GO) Instruction provides guidance for power ascension from approximately 30 to 100% power, at power conditions, power reduction from 100 to 30% power, Power Coastdown at End of Life operations, and Load Follow operations.

This instruction provides additional guidance for turbine control restoration following a turbine runback.

1.2 Scope

This GO contains the following sections:

5.1 Power Ascension From 30% Power to 100%

5.2 At Power Conditions

5.3 Power Reduction From 100% to 30%

5.4 Power Coastdown at End of Life

5.5 Load Follow Operations

2.0 REFERENCES

2.1 Performance References

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

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

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

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

E. 1,2-SO-2-9, *Condenser Vacuum and Turbine Steam Seal Systems Operation*

F. 0-SO-12-1, *Auxiliary Boiler System*

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

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

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

J. 1,2-SO-62-1, *Chemical and Volume Control System*

K. 0-SO-62-7, *Boron Concentration Control*

L. 1,2-SO-62-9, *CVCS Purification System*

M. 0-SO-68-3, *Pressurizer Spray and Heater Pressure Control System*

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

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

P. 0-SI-OPS-092-078.0, *Power Range Neutron Flux Channel Calibration By Heat Balance Comparison*

Q. 0-SI-CEM-000-050.0, *72-Hour Chemistry Requirements*

R. 0-SI-CEM-030-407.2, *Radioactive Gaseous Waste Effluent Particulate and Iodine Dose Rates from Shield and Auxiliary Building Exhausts (Weekly/Special) and Condenser Vacuum Exhausts (Special)*

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

T. 0-SI-OPS-000-001.0, Initial Startup System Parameter Log

U. TI-40, *Determination of Preconditioned Reactor Power*

2.1 Performance References (continued)

V. 2-SO-98-1, *Distributed Control System*

2.2 Developmental References

A. Memorandum from System Engineering concerning MSR operation - RIMS S57 880322 999

B. Memo from Reactor Engineering - RIMS S57 941219 934

C. S57-880322-999 and S57-880808-851

D. W Letter GP89-076 (RIMS No. S53 890427 984)

E. W Letter GP 89-155 (RIMS S57 891026 972)

F. W Letter GP 86-02(B44 861112 002)

G. SSP-2.3, *Administration of Site Procedures*

H. TVA-NQA-PLN89-A

I. GOI-10, *Reactivity Control at End of Cycle Life* (Trojan Nuclear Plant)

J. FSAR, Section 13.5

K. Memo from Reactor Engineering - August 6, 1996 (G Bair)

L. NERC Reliability Standard, VAR-002-1.1b

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

A. To ensure that NIS Reactor Power level indications remain within 2% of true power during power level changes, a check should be performed about every 20% power level change, when greater than 15% power, by comparing calorimetric power to each NIS Power Range drawer. The 20% power level check does not preclude the operating crews from making necessary changes in response to changing plant conditions.

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 or equal to 250°F.

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

C. The following should be used to determine the most accurate reactor power indication for comparison with NIS:

- When reactor power is greater than 15%, use LEFM calorimetric power indication (U2118).
- If LEFM is NOT available, then use average loop ΔT (UO485 or M-5 indicators) up to 40%. Above 40%, use computer point U1118.

D. 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 Ltr GP 89-155; RIMS S57 891026 972)

E. Pressurizer heaters and sprays may be operated as required to maintain pressurizer and RCS boron concentration within 50 ppm. If loop boron concentration is changed by 20 ppm or greater, use the pressurizer backup heaters to initiate automatic spray (if available). If Normal Spray is NOT available, then use Auxiliary Spray (1, 2-SO-62-1, Section 8.7) in conjunction with pressurizer backup heaters.

3.1 Precautions (continued)

F. Condensate DI polishing operations during power ascension are controlled by staying within system parameters and by recommendations from the Chemistry Section.

G. The valve position limiter should be periodically positioned approximately 10% above the current governor control indications (keeps governor valves off of the limiter) as turbine load is changed. 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.

H. Any off-frequency turbine operation is to be reported to Engineering for record keeping. The report will include duration and magnitude of off-frequency operation.

I. 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.

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

K. Initial Startup After Refueling - 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 at the following RTP hold points. Reactor Engineering and/or Systems Engineering will determine procedure performance. [C.3]

1. At < 50% RTP a flux map and single point alignment, a hot channel factor determination, an axial imbalance comparison, and a PR NIS calibration will be performed. The PR high range trip setpoint will then be increased to its normal value of 109%.

2. At < 75% RTP, calorimetric calculations and RCS flow verification may be performed, EAGLE-21 updated prior to increasing power, a flux map, a hot channel factor determination, an axial imbalance comparison may be required if not performed at < 50%, a detector calibration (if Δ AFD $\geq$ 3%), and a PR NIS calibration may be performed.

3.1 Precautions (continued)

3. If not performed at 75% hold point, an axial imbalance comparison and a detector calibration (if Δ AFD ≥ 3%) should be performed at ~ 100% RTP. Engineering will determine if PR NIS calibration must be performed. Calorimetric calculations, RCS flow verification, a hot channel factor determination, and a reactivity balance will be performed and EAGLE-21 updated. Reactor Engineering will notify Operations that normal full power operations may proceed.

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

5. N/A 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.

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

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

   b. 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.

   c. 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.*

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

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

L. N/A Declared fuel defects, as determined by the Fuel Reliability Assessment Team or the Shift Manager, have limited ramp rates during Reactor Power increases as specified in TI-40.

M. TI-40 power increase limits that are exceeded, in any one hour, are evaluated in accordance with SPP-3.1.

3.1 Precautions (continued)

N. Power Coastdown At End Of Life:

N/A

1. Reactor power changes should be limited to less than or equal to 1% per hour to avoid causing xenon peaking which could force a plant shutdown.

2. Do not perform unnecessary unit power maneuvers or testing (e.g., turbine valve testing). Such testing could result in an uncontrollable Xenon oscillation.

3. Nonessential work on systems which could cause a plant upset should be deferred.

4. Secondary Plant runbacks such as Main Feed Pump Turbine trip or #3 Heater Drain Tank runback will require a unit shutdown if Reactor power is not promptly returned to pre-transient level due to the resulting severe Xenon transient. If a system power alert is in effect, and electrical generation is critical, unit load should be reduced as necessary keeping T_{AVG} on program. Contact Reactor Engineering for an evaluation and guidance concerning unit shutdown or reduction of load.

5. Management should be consulted to evaluate the feasibility of a unit restart if a reactor trip occurs with RCS equilibrium boron concentration less than 50 ppm. If the reactor is to be restarted, the power level shall be limited to nominal pre-trip power level.

O. Axial Flux Difference Management:
When the reactor is operating at a steady power or during normal load changes, maintain ΔI within the operating limits of the Core Operating Limits Report (COLR). It is recommended that the core axial flux difference (AFD) be maintained within ± 5% of the target band at all times, excluding the performance of 0-PI-NUC-092-036.0, "Incore - Excore Calibration," and End of life power coast downs. Operating time outside the band, which is given in TI-28 Attachments 1 and 2, should be minimized. Reactor Engineering should be contacted if time out of the ± 5% target band exceeds approximately 30 minutes.

P. The position of control 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 5 steps below this guidance for long term, then impact may occur to safety analysis assumptions.

Q. During heatup and cooldown transients, RCS density changes will cause changes in NIS indicated power. At constant reactor power, a 1°F change in T_{AVG} may cause as much as a 1% (or more) change in indicated NIS power.

3.1 Precautions (continued)

R. The following limitations are applicable to Unit Two ONLY.

N/A 1. In winter months #7 HDTP capacity is not adequate to pump #6 Heater drains when all Condensate Demineralizer pumps are in service. Current practice is to run two Cond DI Pumps and / or throttle the condensate system to reduce backpressure. The preferred method is to throttle condensate pressure instead of running only two Condensate Demineralizer booster pumps at full power due to pump runout concerns.

2. Siemens-Westinghouse analysis has determined that the maximum unit power with one MFP operation is 65% under worst case conditions. The plant could operate higher if plant conditions permit.

3. MFP flow from the lead MFP should not exceed 53.7% of the total flow. Flow rates above this would result in HP steam flow to the lead MFPT. Computer points 1(2)UO504 and UO505 can be used to monitor.

S. Voltage Control

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Operation of the Main Generator without Automatic Voltage Control could impact grid voltage requirements. Refer to GOI-6 for MVAR limits.

2. When the Main Generator is connected to the grid, the voltage regulator shall be operated in Automatic, unless coordinated with the Transmission Operator (SELD).

3. Main Generator operation outside of the Transmission Voltage Schedule requires coordination with the Transmission Operator, and notation in the operator's Log of time, reason, and that the Transmission Operator notification was made.

4. When directed to modify voltage, the Generator Operator shall comply (within plant procedural requirements) or provide an explanation of why the schedule cannot be met.

5. While the Main Generator is tied to the grid perform the following:

   a. The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between AUTO and Manual as soon as practical but notification shall be within 30 minutes.

3.1 Precautions (continued)

b. The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfers between Manual and Auto.

c. All position changes (to and from Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration and notifications made.

T. Reliability Directives and Protective Relay/Equipment Failures

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Plant Operations shall notify the Transmission Balancing Authority (BA) or Transmission Operator of protective relay or equipment failures that creates a creditable risk to Plant Generation. A creditable risk to generation represents a potential reduction in transmission system reliability.

2. Reliability Directives to the Generator Operator are via the Balancing Authority or Transmission Operator. Required action time may range from immediate to no longer than 30 minutes. Actions shall be taken without delay. The directives may be associated with preventing or clearing Local System issues, or neighboring system issues.

3. Plant operations shall take timely actions as directed by the Balancing Authority or Transmission Operator to mitigate critical conditions to return the bulk electrical system to a reliable state. Plant operations shall comply with Balancing Authority or Transmission Operator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements.

4. Plant Operations shall immediately inform the Balancing Authority or Transmission Operator of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

3.2 Limitations

A. When the axial flux difference monitor alarm is inoperable, the AFD must be logged every hour by performing 0-SI-NUC-000-044.0.

(SR 4.2.1.1.a.2 & 4.2.1.1.b)

B. When both the plant computer and NIS QPTR alarm systems are inoperable, the QPTR must be calculated every 12 hours by performing 0-SI-NUC-000-133.0. (SR 4.2.4.1.b)

C. Do not exceed a load change rate of plus or minus 5% per minute or a step change of 10%.

D. River water temperatures shall be maintained within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0.

NOTE

Westinghouse should be contacted if the turbine is operated outside of its operating limits as stated below.

E. To prevent high vibratory stresses and fatigue damage to the last stage turbine blading, do not operate the turbine 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)

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.

F. Do not allow the generator to become underexcited.

G. 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 0-SI-CEM-000-050.0, 0-SI-CEM-030-407.2 and 0-SI-CEM-000-415.0 due to the thermal power change.

3.2 Limitations (continued)

H. The following Main Turbine vibration limitations and actions should be adhered to:

1. Vibration levels which exceed 7 mils (alarm setpoint) should be verified by Predictive Maintenance Group.
2. Vibration levels greater than 7 mils and less than 14 mils should be continuously monitored by Predictive Maintenance Group.
3. IF vibration level is greater than or equal to 14 mils, THEN TRIP the turbine.

I. Westinghouse recommends that if any throttle valve is held closed for more than 10 minutes, then it should be re-tested immediately upon reopening in accordance with 1,2-PI-OPS-047-002.0.

J. The generator may be operated without a bus duct cooler up to approximately 729 MW turbine load.

K. To ensure sufficient voltage for a safe shutdown after loss of both units, voltage and reactive power should be maintained within the limits of GOI-6.

L. With LEFM calorimetric power indication available, full power operation is defined as approximately 3455 MW_T not to exceed 3455.0 MW_T averaged over a 8-hour period. [C.1] If LEFM is available, power shall be monitored using plant computer point U2118 Instantaneous Value. **DO NOT** allow average thermal power to exceed 3455 MW thermal for two consecutive hours. Every effort should be made to maintain core thermal power 10 minute average less than 3455 MWt.

M. The following restrictions apply if LEFM calorimetric power indication (U2118) is unavailable:

1. Applicable action of TRM 3.3.3.15 must be entered.
2. AFD limits in COLR and TI-28 must be made more restrictive by 1%.
3. Rod insertion limits in COLR must be raised by 3 steps.
4. If reactor power is greater than 40%, power should be monitored using U1118. If U1118 is also unavailable, use the highest reading NIS channel.
5. If reactor power is less than 40%, use the RCS average ΔT as the preferred method for determining power level.

3.2 Limitations (continued)

N. IF equilibrium conditions are achieved, after exceeding by 10% or more of rated thermal power the thermal power at which the heat flux hot channel factor was last determined, THEN conditional performance of 0-SI-NUC-000-126.0, Hot Channel Factor Determination is required.

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. With one LP heater string out of service (isolated), power is limited to 86% (Unit 1) or 90% (Unit 2). This is based on LP turbine blading limitations. (Ref: DCN E21203A).

Q. #3 heater drain tank should remain drained with LCV-6-105A and B failed open (per 1, 2-SO-5-2) until reactor power exceeds ~45-50%. This will prevent intermediate heater string isolations if a turbine trip occurs at lower power levels. If a level is established in the number 3 Heater Drain Tank prior to exceeding P-9 setpoint (50% power), a turbine trip will result in Intermediate Pressure Heater string isolation(s).

STARTUP No. 1 **Unit** 1 **Date** Today

4.0 PREREQUISITES

NOTES

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

2) Prerequisites may be completed in any order.

[1] **ENSURE** Instruction to be used is a copy of effective version. RO1 Today

[2] T_{AVG} is being maintained within 1.5°F of T_{REF}. ☑

[3] SG level controls are being maintained in AUTO (**N/A** if auto control **NOT** available). ☑

[4] Control rods are being maintained within the operating band of Core Operating Limits Report (COLR) (**N/A** if shutting down due to dropped or misaligned rod). ☑

[5] Steam dump control system is in the T_{AVG} mode (**N/A** if Tavg Mode **NOT** available). ☑

[6] The EHC system should be in OPER AUTO (pushbutton lit). ☑

[7] Generator pressurized with hydrogen according to capability curve. (TI-28, Fig. A.I4) ☑

[8] PRMs are being maintained within ±2% of core thermal power readings. ☑

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 No. 1 Unit 1 Date Today

4.0 PREREQUISITES (continued)

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

Print Name	Initials
Reactor Operator 1	RO1
Reactor Operator 2	RO2
Sr Reactor Operator	SRO
Shift Manager	SM
Reactor Engineer	RE
Chemistry Supervisor	CS

5.0 INSTRUCTIONS

CAUTION

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

NOTES

1) Radiation Protection should be notified during normal plant operations if power level increases or decreases are either stopped or started.

2) Guidance on restoration of EHC Controls after a BOP runback is contained in Appendix B, *Turbine Runback Restoration.* [C.4]

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100%

NOTES

1) Failure to comply with the NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.

2) The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]

3) The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.

4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.

5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.

6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made.

7) 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 30 minutes.

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

[1] **ENSURE** Section 3.0 Precautions and Limitations has been reviewed and Section 4.0, Prerequisites complete. 3RO

[2] **VERIFY** from Chemistry Section that SG and feedwater secondary chemistry is within acceptable limits. ☑

Scott Sayer
Chemistry personnel contacted

[3] **IF** this is a startup following refueling, **THEN**

ENSURE applicable portions of 0-RT-NUC-000-001.0 are **COMPLETE** for operation above 35% power. N/A RB
Rx Engr.

STARTUP No. 1 Unit 1 Date 1

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) This step may be performed out of sequence as necessary to meet power level.

2) 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.

[4] **PERFORM** the following at approximately 35% reactor power:

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

CALCULATE Calorimetric power:

Calorimetric power= U2118 $\frac{N/A}{34.55}$ = N/A %

N/A ☑

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

CALCULATE reactor power:

Average value of RCS ΔT (U0485)= N/A % N/A

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

N-41	(XI-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 ☐

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

PERFORM 0-SI-OPS-092-078.0.

STARTUP No. 1 Unit 1 Date today

5.1 Power Ascension From 30% to 100% (continued)

[4.5] **MONITOR** PRMs deviation from core thermal power continuously during performance of this procedure
AND
PERFORM 0-SI-OPS-092-078.0 if the deviation is >2%. RO

NOTES

1) With reactor engineering concurrence, power increase per steps 5.1[6] through 5.1[10] may be performed in parallel with this step.

2) If startup is following refueling operations and secondary side chemistry is acceptable for power increase, then N/A Step 5.1[5]. (Startup Reactivity Calibrations and Tests will be performed at ≈ 45% Reactor Power if not performed at ≈ 30% Power).

[5] **IF** startup is following refueling activities and secondary chemistry hold is precluding power ascension, **THEN**

ENSURE the following have been performed prior to exceeding 50% rated thermal power: (May be performed in any order)

[5.1] 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

N/A Rx Eng N/A Date

[5.2] 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

SRO Today's Det

Rx Eng Date

[5.3] 0-PI-NUC-092-002.0, Detector Single Point Alignment.

Rx Eng Date

STARTUP No. 1 **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[5.4] 0-PI-IXX-092-N45.0, PR NIS Calibration.

N/A MIG N/A Date

SRO plays date

[5.5] PR High Flux Trip reset to 109%. [C.3].

MIG Date

[5.6] Applicable portions of 0-RT-NUC-000-001.0 **COMPLETE** for operation above 50% power.

Rx Eng Date

[6] **DETERMINE** the following from TI-40 and **RECORD** in narrative log and below:

[6.1] Reactor preconditioned power level. N/A ☑

[6.2] Ramp rate restrictions: ☐

N/A %/hour up to N/A % reactor power

___ %/hour up to ___ % reactor power

___ %/hour up to ___ % reactor power

[6.3] Restrictions on AFD and rod withdrawal rate: (N/A if not applicable) ☑

Per Rx Spreadsheet

[7] **VERIFY** TI-40 limits listed above.

RE Rx Eng

SM SM

[8] **MONITOR** TI-40 limits (using ICS trend features if available). ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Raising load on the Main Generator will cause VARs to trend in the negative direction (toward incoming). This will require raising generator voltage. Refer to GOI-6 Section E for MVAR limits for generator stability. Refer to precautions R, S, T, and V.

[9] **PERFORM** the following as required:

[9.1] IF Automatic Voltage Control is in service,
THEN
ADJUST Main Generator VARs **USING**
[HS-57-22] Exciter Voltage Auto Adjuster as necessary during power escalation. RQ

[9.2] **IF** necessary to remove Automatic Voltage Control from service,
THEN
PERFORM required steps in Appendix E. RQ

[9.3] IF Automatic Voltage Control is NOT in service,
THEN
ADJUST Main Generator VARs **USING**
[HS-57-23] Exciter Voltage Base Adjuster as necessary during power escalation. N/A RQ

NOTES

1) Steps 5.1[10] through 5.1[16] may be performed concurrently or out of sequence.

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

3) 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.

[10] **INITIATE** power increase to between 45 and 49% and

MAINTAIN valve position limit approximately 10% above current governor control indication as turbine load is changed. ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[11] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}.(0-SO-62-7) ☑

[12] **PERFORM** the following during power increase:

NOTE

T_{AVG} will be programmed from 547°F at no load to 578.2°F at 100% load at a rate of 0.312°F per % power.

[12.1] **MONITOR** T_{AVG} following TREF on program. ☑

[12.2] **MONITOR** pressurizer level on program (25 to 60% as a function of T_{AVG}). ☑

NOTE

If LEFM is available, computer point U2118 should be used as true reactor power. If LEFM is NOT available, use U1118 when greater than or equal to 40% and the average value of RCS ΔT when less than 40%.

[12.3] **MONITOR** 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. ☑

NOTE

Generator MVARs may be reduced if the Generator Stator Ground Fault Relay indication approaches the alarm value of 50%. Refer to GOI-6 Section E for MVAR limits for generator stability.

[12.4] **MONITOR** generator conditions in accordance with **0-SO-35-4,** *Monitoring Generator Parameters.* [C.6] ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

NOTE

The turbine load increase should be stopped until the MFW Reg valves are operating in the acceptable band.

[12.5] **ENSURE** MFW Reg valves are operating properly in auto (within ± 5% from zero deviation is acceptable). ☑

[12.6] **IF** MFW Reg. valves are NOT maintaining within the 5% band, THEN

NOTIFY Instrument Maintenance. ☑

CAUTION

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

NOTE

Instrument Maintenance support may be required if controller adjustments are needed.

[12.7] **ENSURE** Feedwater Heaters 5 and 6, MSR Drain Tank, and #7 Heater Drain Tank level controllers are adjusted to maintain levels within normal ranges. ☑

[13] **WHEN** reactor power is approximately 35%, **THEN**

VERIFY annunciator XA-55-4A, window C-5:

P-8 LOW POWER LOW FLOW TRIP BLOCK

is **DARK**. ☑

[14] **IF** unit is returning to service after a power reduction and the MSRs were removed from service, **THEN**

PLACE MSR HP steam warming valves to **OPEN** position:

STARTUP No. 1 **Unit** 1 **Date** to dy

5.1 Power Ascension From 30% to 100% (continued)

MSR	HANDSWITCH	WARMING VALVE	INITIALS	
A1	HS-1-142	FCV-1-142	RO1 1st	RO2 CV
B1	HS-1-144	FCV-1-144	RO1 1st	RO2 CV
C1	HS-1-146	FCV-1-146	RO1 1st	RO2 CV
A2	HS-1-136	FCV-1-136	RO1 1st	RO2 CV
B2	HS-1-138	FCV-1-138	RO1 1st	RO2 CV
C2	HS-1-140	FCV-1-140	RO1 1st	RO2 CV

NOTE

#3 heater drain tank should remain drained with LCV-6-105A and B full open until reactor power exceeds ~45-50%.

[15] **ENSURE** #7 heater drain tank is on recirc in accordance with 1,2-SO-5-3. ☑

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

- [16.1] Condensate booster pumps. ☑
- [16.2] Hotwell pump. ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) When placing additional condensate pumps in service, or HDT pumps in service, ensure that the MFW Reg. valves respond correctly and then stabilize in the acceptable band.

2) The following step may be performed out of sequence and may be marked N/A if it was previously performed in 0-GO-4.

[17] **WHEN** ~~the~~ condensate booster pump reaches approximately 140 amps, **THEN**
~~**START** the~~ following pumps in accordance with 1,2-SO-2/3-1:

[17.1] Third HW pump (if available). ______

[17.2] Second CBP. ______

NOTES

1) When placing additional condensate pumps or HDT pumps in service, ensure that the MFW Reg. valves respond correctly and then stabilize in the acceptable band.

2) With approval from Ops Superintendent, pumping forward of #7 Heater Drain System may be deferred until turbine load is approximately 60%, if system conditions warrant.

3) Steps 5.1[18] through 5.1[23] may be performed out of sequence.

[18] **WHEN** confirmation obtained from Chemistry Section that #7 heater drain tank chemistry is in limits, **THEN**

START pumping forward using the #7 heater drain tank pumps using 1,2-SO-5-3. ______

[19] **MAINTAIN** Condensate Booster Pump suction pressure greater than or equal to 75 psig (PI-2-77). ☑

[20] **MAINTAIN** Main Feedwater Pump suction pressure greater than 330 psig (PI-2-129). ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

CAUTIONS

1) **MSR heatup limits are restricted to 100°F per hour or 25°F in a 15-minute period (automatic mode) or 50°F in a 30-minute period (manual mode). (SECO limits, contract 85P62-836839)**

2) **On the LP turbine inlet, do NOT exceed an instantaneous change of 50°F or a rate of change of 125°F/Hr for turbine expansion considerations.**

3) **For a cold start, the HP bundle warming valves should be opened at least 15 minutes before bringing the MSR in service.**

NOTES

1) Placing MSRs in service before 35% turbine load can cause rotor long condition.

2) Step 5.1[21] may be N/A'd if MSRs are in service.

[21] **WHEN** ≥ 35% turbine load, **THEN**

[21.1] **IF** cold start (LP turbine inlet metal temperature less than 300°F), **THEN** **DEPRESS** the RESET pushbutton on the moisture separator reheater control panel. N/A ☐

STARTUP No. 1 **Unit** 1 **Date** to dy

5.1 Power Ascension From 30% to 100% (continued)

[21.2] **CLOSE** the following steam inlet leakoff isolation valves:

MSR	VALVE	POSITION	INITIALS
A-1	1-679	CLOSED	RDi
	1-714	CLOSED	
B-1	1-680	CLOSED	
	1-715	CLOSED	
C-1	1-681	CLOSED	
	1-716	CLOSED	
A-2	1-682	CLOSED	
	1-717	CLOSED	
B-2	1-683	CLOSED	
	1-718	CLOSED	
C-2	1-684	CLOSED	
	1-719	CLOSED	

NOTE

Due to interlocks on MSR valves, bypass valves must be opened prior to main isol valves. For example: Open FCV-1-241 and when full open, then open FCV-1-141.

[21.3] **ENSURE** MSR HP steam supplies ALIGNED as follows:

MSR	EQUIPMENT	HANDSWITCH	POSITION	√
A1	MSR BYPASS ISOL	HS-1-241A	OPEN	☑
	MSR MAIN ISOL	HS-1-141A	OPEN	☑
B1	MSR BYPASS ISOL	HS-1-243A	OPEN	☑
	MSR MAIN ISOL	HS-1-143A	OPEN	☑
C1	MSR BYPASS ISOL	HS-1-245A	OPEN	☑
	MSR MAIN ISOL	HS-1-145A	OPEN	☑
A2	MSR BYPASS ISOL	HS-1-235A	OPEN	☑
	MSR MAIN ISOL	HS-1-135A	OPEN	☑
B2	MSR BYPASS ISOL	HS-1-237A	OPEN	☑
	MSR MAIN ISOL	HS-1-137A	OPEN	☑
C2	MSR BYPASS ISOL	HS-1-239A	OPEN	☑
	MSR MAIN ISOL	HS-1-139A	OPEN	☑

STARTUP No. 1 **Unit** 1 **Date** To day

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Control valves ramp open for 120 minutes for turbine cold start.

2) MSR Control valves ramp open from the 400°F position to full open in one hour when Hot Start button was previously depressed during performance of 0-GO-4 or 0-GO-11.

[21.4] **DEPRESS** the RAMP pushbutton on the moisture separator reheater control panel to initiate steam flow to the reheater. ☑

[21.5] **IF** MSR controls will NOT function in RAMP mode, **THEN** **PERFORM** the following:

N/A

- A. **DEPRESS** MANUAL pushbutton on MSR control panel. N/A
- B. **ADJUST** manual potentiometer to gradually open MSR TCVs over approx. 120 minutes **WHILE** continuing in this procedure. N/A

[21.6] **OPEN** all MSR OPERATING vents (6-3 thru 6-93) on panel XS-6-3.

[21.7] **CLOSE** all MSR STARTUP vents (6-1 thru 6-91) on panel XS-6-1.

[21.8] **PERFORM** App. C to locally isolate MSR startup vents.

[21.9] **ENSURE** MSR HP steam warming valves are CLOSED:

MSR	EQUIPMENT	HANDSWITCH	POSITION	√
A1	MSR WARMING LINE	HS-1-142	CLOSED	☑
B1	MSR WARMING LINE	HS-1-144	CLOSED	☑
C1	MSR WARMING LINE	HS-1-146	CLOSED	☑
A2	MSR WARMING LINE	HS-1-136	CLOSED	☑
B2	MSR WARMING LINE	HS-1-138	CLOSED	☑
C2	MSR WARMING LINE	HS-1-140	CLOSED	☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

[21.10] **IF** this power ascension is during the months of October 1 through March 31, **THEN**

REFER to 0-PI-OPS-000-006.0 and consult System Engineer for position of MSR doghouses' vent dampers. N/A

[21.11] **IF t**his power ascension is during the months of April 1 through September 30, **THEN**

OPEN MSR doghouses' vent dampers. _____

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.

[22] **IF** #7 heater drain tank (HDT) pressure is indicating an overpressure condition, **THEN**

PERFORM 1,2-SO-5-3, Section 8.0, Infrequent Operation to prevent #7 HDT overpressurization. _____

[23] **WHEN** approximately 40% turbine load:

[23.1] **VERIFY** annunciator XA-55-4A, window E-7:

C-20 AMSAC ARMED

is **LIT**.

☐

[23.2] **CLOSE** the drains on the operating main feedwater pump turbine (N/A other pump).

MFPT	DESCRIPTION	HANDSWITCH	POSITION	INITIALS
A	DRAIN VALVES	HS-46-14	CLOSED	_____
B	DRAIN VALVES	HS-46-41	CLOSED	_____

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) With verbal approval from the Operations Superintendent, placing the second main feed pump in service may be deferred until power is approximately 55% (Unit 1) or 65% (Unit 2). Logic prevents opening the standby MFPT condenser isolation valves if the pump is **NOT** reset prior to exceeding 9 million lbs/hr flow on the running pump.

2) LCO 3.3.2.1 (3.3.2) functional unit 6.f (AFW start function for the trip of both MFPT) allows one channel to be inoperable in Mode 1 for up to 4 hours when starting up or shutting down the second MFPT.

[24] **WHEN** approximately 40 to 45% turbine load, **THEN**

PLACE second MFPT in service by performing the following:

[24.1] **IF** the Operations Superintendent has approved one MFP operation during the power ascension, **THEN**

A. **RECORD** which MFPT is in service.
MFPT _________ _________

B. **MONITOR** loading of the MFP in service as load is increased. ☐

[24.2] **WHEN** second **MFPT** is to be placed in service, **THEN**

PLACE second MFPT in service in accordance with 1,2-SO-2/3-1. ☐

NOTE

This step and individual substeps may be performed out of sequence.

[25] **PERFORM** the following as system parameters permit:

[25.1] **VERIFY** three (3) Hotwell pumps running (if available). ☐

[25.2] **VERIFY** two (2) Condensate booster pumps running. ☐

[25.3] **VERIFY** MFW pump(s) in service (only 1 required if approved by Operations Superintendent). ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

[25.4] **VERIFY** one (1) #7 Heater Drain Tank pump in service. ☐

[25.5] **ENSURE** one gland steam exhauster running and one stopped in AUTO position:

EXHAUSTER	HANDSWITCH	(√)	(√)
A	HS-47-209A	AUTO ☐	START ☐
B	HS-47-209B	AUTO ☐	START ☐

[25.6] **IF** gland seal water is being supplied from opposite unit, **THEN**

RESTORE normal gland seal water alignment (supplied from this unit) in accordance with 1,2-SO-37-1, Gland Seal Water System. ☐

NOTE

Steps 5.1[26] through 5.1[31] may be performed out of sequence.

[26] **IF** the second #7 heater drain tank pump has not been started, **THEN**

START the second #7 heater drain tank pump in accordance with 1,2-SO-5-3. ________

NOTE

Hydrogen pressure should be maintained greater than or equal to 66 psig.

[27] **ENSURE** generator hydrogen pressure is sufficient for anticipated load in accordance with TI-28, Figure A.14, Generator Capability Curve. ________

[28] **VERIFY** river water temperature within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

> **CAUTION**
>
> **After refueling operations, NIS indications may be inaccurate until calibration at higher power levels. DO NOT increase power greater than 50% until Rx Engineering has ensured that applicable portions of 0-RT-NUC-000-001.0 are complete.**

[29] **IF** applicable portions of 0-RT-NUC-000-001.0 are complete for power increase above 50% of rated thermal power,
THEN
N/A the following Step 5.1[30]. (Reactor Engineering) ________

[30] **IF** startup is following refueling activities, **THEN**
ENSURE the following performed prior to exceeding 50% thermal power: (may be performed in any order)

A. 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

__________ Rx Eng __________ Date

B. 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

__________ Rx Eng __________ Date

C. 0-PI-NUC-092-002.0, Detector Single Point Alignment.

__________ Rx Eng __________ Date

D. 0-PI-IXX-092-N45.0, PR NIS Calibration..

__________ MIG __________ Date

E. PR High Flux Trip reset to 109%. [C.3].

__________ MIG __________ Date

F. Applicable portions of 0-RT-NUC-000-001.0 **COMPLETE** for operation above 50% power.

__________ Rx Eng __________ Date

STARTUP No.________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

[31] **WHEN** reactor power is approximately 49%, **THEN**

PERFORM the following: (in any order).

[31.1] **ENSURE** indicated Axial Flux Difference is within the limits specified in the COLR (TS 3.2.1.1). ________

[31.2] **PERFORM** a conditional 0-SI-NUC-000-044.0, *Axial Flux Difference*. ________

NOTE

QPTR alarms pertain to the plant computer and annunciator panel AR-M4-B, windows B-3, C-3, and D-4. Alarms may sporadically occur at 1.5% when the setpoint is 2%.

[31.3] **PERFORM** a conditional 0-SI-NUC-000-133.0, *Quadrant Power Tilt Ratio*. ________

[31.4] **IF** QPTR exceeds 1.015,
THEN
CONTACT Reactor Engineering for evaluation. ________

[32] **DETERMINE** the following from TI-40 and **RECORD** in narrative log and below:

[32.1] Reactor preconditioned power level. ________ ☐

[32.2] Ramp rate restrictions: ☐

______ %/hour up to ______ % reactor power

______ %/hour up to ______ % reactor power

______ %/hour up to ______ % reactor power

[32.3] Restrictions on AFD and rod withdrawal rate:
(N/A if not applicable) ☐

____

____

STARTUP No._________ **Unit _____** **Date _________**

5.1 Power Ascension From 30% to 100% (continued)

[33] **VERIFY** TI-40 limits listed above.

____
Rx Eng

____
SM

[34] **CONTINUE** reactor power ascension to 74%. ☐

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[35] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

NOTE

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

[36] **MONITOR** the turbine load increasing and

MAINTAIN valve position limit approximately 10% above current governor control indication as turbine load is changed. ☐

STARTUP No.__________ Unit _____ Date _________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Steps 5.1[37] through 5.1[40] may be performed out of sequence.

[37] **WHEN** greater than or equal to 50% reactor power, **THEN**

[37.1] **VERIFY** annunciator XA-55-4A, window E-4:

P-9 LOW POWER
TURB TRIP-REAC
TRIP BLOCK

is **DARK.**

[37.2] **PLACE** #3 Heater Drain Tank Pumps on recirc **USING** 1, 2-SO-5-2, No. 3 Heater Drain Tank and Pumps. ☐

[37.3] **VERIFY** annunciator XA-55-4B, window B-3:

NIS POWER RANGE
UPPER DETECTOR
HI FLUX DEVN OR
AUTO DEFEAT

is **DARK.** ☐

[37.4] **VERIFY** annunciator XA-55-4B, window C-3:

NIS POWER RANGE
LOWER DETECTOR
HI FLUX DEVN OR
AUTO DEFEAT

is **DARK.** ☐

[37.5] **VERIFY** annunciator XA-55-4B, window D-4:

COMPUTER ALARM
ROD DEV & SEQ
NIS PWR RANGE
TILTS

is **DARK.**

[37.6] **U2 ONLY: ENSURE** MFW Bypass valves in MANUAL and CLOSED. ☐

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Valves 106A and 106B shall be verified to be controlling properly after each #3 HDT pump start.

[38] **WHEN** confirmation obtained from Chemistry Section that #3 heater drain tank chemistry is within limits, **THEN**

[38.1] **START** pumping forward using two (2) #3 heater drain tank pumps using 1, 2-SO-5-2. _________

[38.2] **IF** pumping forward with #3 HDT, **THEN**

ENSURE 1,2-LCV-6-106A and B are maintaining #3 heater drain tank level. ☐

[39] **ENSURE** MFPTC vacuum normal (greater than 20 inches HG vacuum) using PI-2-331A and PI-2-331B on Panel L-69. ☐

NOTE

During power operation above 50%, condenser air inleakage should be maintained less than 6 CFM.

[40] **IF** condenser air in-leakage exceeds 15 CFM, **THEN**

INITIATE actions to identify the source of in-leakage and **NOTIFY** Engineering and Ops Supt or Plant Manager. _________

NOTES

1) Steps 5.1[41] through 5.1[43] may be performed out of sequence.

2) 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.

[41] **PERFORM** the following at approximately 55% reactor power:

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

CALCULATE Calorimetric power:

Calorimetric power= U2118 $\frac{\_\_\_\_\_\_}{34.55}$ = _______%

5.1 Power Ascension From 30% to 100% (continued)

☐

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

CALCULATE reactor power:

Calorimetric power= $\frac{U1118\ \_\_\_\_\_\_}{34.11}$ = _______%

☐

[41.3] **VERIFY** that all operable NIS Power Range channel drawers are within ± 2% of the calculated calorimetric power.

N-41	(XI-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 ☐

____

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

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

NOTES

1) More restrictive turbine load limit for Unit 1 is based on ensuring adequate MFP suction pressure to allow pumping against higher S/G pressures following S/G replacement. (Ref: DCN E21203A).

2) Siemens Westinghouse analysis has determined that the maximum Unit Two unit power with 1 MFP operation is 65% under worst case conditions. Operation at higher power levels are dependent on current conditions. This would require System Engineering evaluation.(Ref: DCN D21732A).

[42] **ENSURE** second MFPT is in service <u>PRIOR TO</u> increasing turbine load above 55% (Unit 1) or 65% (Unit 2). ________

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

#3 and #7 heater drains must be pumping forward prior to exceeding 60% turbine load. This load limit assumes that both MFW pumps are in service. If only one MFWP is running, turbine load must be further limited to maintain adequate MFWP suction pressure.

[43] **PERFORM** the following PRIOR TO increasing turbine load above 60%.

[43.1] **ENSURE** #3 Heater Drain Tank pumping forward **USING** 1, 2-SO-5-2. ________

[43.2] **ENSURE** #7 Heater Drain Tank pumping forward **USING** 1, 2-SO-5-3. ________

[44] **ENSURE** at least one bus duct cooler is in service **USING** 0-SO-58-1 PRIOR TO increasing load above 729 MWe. ________

NOTES

1) TI-40 ramp rate restrictions are recorded in Step 5.1[32].
2) The following step may be marked N/A if intermediate power threshold is NOT applicable.

[45] **WHEN** Reactor Power approaches the Intermediate Power Threshold for the respective unit, **THEN**

ENSURE Reactor Power ramp rate target is **ESTABLISHED** at 2% / hr.

Intermediate Power Threshold value __________ ________

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTIONS

1) **Valves 106A and 106B shall be verified to be operating properly after each #3 HDT pump start.**

2) **At approximately 79% turbine load with LCV-6-105A or B open and only two #3 HDT pumps are in service, the available NPSH for the MFP will be insufficient.**

NOTES

1) When placing HDT pumps in service, ensure main feedwater pumps and main reg valves respond correctly and then stabilize in an acceptable band.

2) LCV-6-105A will come open at about 70% turbine load if condensate discharge pressure is high. Minimize duration at this load to reduce wear on the valve. As load is increased to 100% condensate pressure will gradually decrease allowing the #3 HDT pumps to pump forward and the condenser bypass valve(s) to close.

3) Steps 5.1[46] through 5.1[49] may be performed in any order.

[46] **WHEN** approximately 70% turbine load, **THEN**

[46.1] **PLACE** the third #3 heater drain pump in service in accordance with 1,2-SO-5-2. [C.2] ________

[46.2] **ENSURE** valves LCV-6-106A and LCV-6-106B are controlling #3 heater drain tank level properly. ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Evaluate starting and stopping of Condensate Demineralizer pumps using condensate pressure, MFP inlet pressure, condensate booster pump inlet pressure, and #3 and #7 HDT pump and bypass valve operation. The US/SRO may start or stop Condensate Demineralizer pumps at his discretion, but if any of the following occurs the pumps must be started:

1) **Condensate Booster Pump suction pressure is less than 125 psig, as indicated on [PI-2-77].**

2) **Main Feedwater Pump suction pressure less than 420 psig, as indicated on [PI-2-129].**

3) **Injection Water Pump discharge pressure is less than 265 psig, as indicated by an alarm on XA-55-3B window E-1.**

NOTES

1) Should #7 heater drain tank pump(s) amps swing or if system pressure needs to be increased by approximately 40 psig, then Cond DI Booster pumps can be started; however, two of the three pumps must be started at the same time.

2) When placing condensate pumps in service, ensure MFW Reg. valves respond correctly and then stabilize in an acceptable band.

[47] **EVALUATE** starting two condensate demineralizer booster pumps in accordance with 1,2-SO-2/3-1 (This step can be N/A'd or signed-off at time when pumps are started). ________

NOTE

If starting up following refueling operations and reactivity calculations and tests were completed at ≈ 30% reactor power, then reactivity calculations and tests must be performed again at ≈ 75% RTP.

[48] **IF** all applicable portions of 0-RT-NUC-000-001.0 are complete for power increase above 75% of rated thermal power, **THEN**

N/A the following Step 5.1[49]. (Reactor Engineering) ________

STARTUP No.__________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

> **CAUTION**
>
> **After refueling, NIS indications may be inaccurate until calibration at higher power levels. DO NOT increase power above 75% until applicable portions of 0-RT-NUC-000-001.0 are complete.**

[49] **IF** startup is following refueling, **THEN**

PERFORM the following prior to operation above 75% power: (may be performed in any order)

[49.1] **ENSURE** the following have been performed (may be N/A'd by Reactor Eng. and Instrument Maint. if NOT required):

A. 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

____________ ____________
Rx Eng Date

B. 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

____________ ____________
Rx Eng Date

C. 0-PI-NUC-092-036.0, Incore/Excore Detector Calibration (**N/A** if **NOT** required or if ΔAFD < 3%).

____________ ____________
Rx Eng Date

D. 0-PI-NUC-092-002.0, Detector Single Point Alignment.

____________ ____________
Rx Eng Date

E. 0-PI-IXX-092-N45.0, PR NIS Calibration.

____________ ____________
Rx Eng Date

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

[49.2] **NOTIFY** Systems Eng to perform 0-PI-SXX-000-022.2 to check RCS Loop ΔT Zeros. [C.7] ☐

[49.3] **ENSURE** applicable portions of 0-RT-NUC-000-001.0 are complete for operation above 75% RTP.

____
Rx Engr.

NOTES

1) 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.

2) Steps 5.1[50] and 5.1[51] may be performed out of sequence.

[50] **PERFORM** the following at approximately 75% reactor power:

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

CALCULATE Calorimetric power:

Calorimetric power= U2118 $\frac{\_\_\_\_\_\_}{34.55}$ = ______% ☐

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

CALCULATE reactor power:

Calorimetric power= U1118 $\frac{\_\_\_\_\_\_}{34.11}$ = ______% ☐

[50.3] **VERIFY** that all NIS Power Range A channel drawers are within ± 2% of the calculated calorimetric power.

N-41	(XI-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 ☐

____

5.1 Power Ascension From 30% to 100% (continued)

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

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

CAUTIONS

1) **LCV-6-105A and/or 105B may be throttling open due to condensate system pressure being higher than #3 HDT pump discharge pressure.**

2) **Turbine runback will occur if #3 HDT pump flow to the condensate system drops below 5500 gpm (for greater than 10 seconds), condensate bypass valve LCV-6-105A or 105B opens, and turbine load is above 81% (Unit 1) or 82% (Unit 2).**

[51] **PRIOR** to increasing turbine load above 77%:

ENSURE the following:

[51.1] LCV-6-106A and -106B are controlling properly. ________

[51.2] LCV-6-105A and -105B are **CLOSED.** ________

NOTES

1) Ramp load rate increases shall be within the limits of TI-40

2) Intermediate Power Threshold ramp rate target value of 2% / hr may apply.

[52] **RECORD** power ascension ramp rate from TI-40. ________ ☐

NOTES

1) Operation above 75% Load with only two Hotwell Pumps in service requires further evaluation.

2) Steps 5.1[53] through 5.1[56] may be performed out of sequence.

[53] **CONTINUE** the power ascension to 90% reactor power. ☐

STARTUP No.________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[54] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

> **NOTE**
>
> Guidance on restoration of EHC Controls after a BOP runback via the valve position limiter is contained in Appendix B, *Turbine Runback Restoration.* [C.4]

[55] **MONITOR** the turbine load increasing and

MAINTAIN valve position limit approximately 10% above the current governor control indication as turbine load is changed. ☐

> **NOTE**
>
> When the turbine impulse pressure relay number is illuminated on Panel L-262, the relay is closed and Runback circuit is armed.

[56] **WHEN** greater than 77% Turbine Load, **THEN**

VERIFY [PIS-47-13RLY1] light **[1]**,'Turbine Runback From Loss of 1 MFP' is illuminated on Panel L-262. ________

[57] **WHEN** greater than 82% Turbine Load, **THEN**

VERIFY the following relay lights are illuminated on Panel L-262:

[57.1] **[PIS-47-13RLY2]**, Turbine Runback From #3HDT.**[2]** ☐

[57.2] **[PIS-47-13RLY 3]**, NPSH Protection VLV-6-106B closes on #3 HDT pump trip. **[3]** ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Reactor power can be increased greater than 90% as long as adequate MFP suction is maintained.

2) Steps 5.1[58] through 5.1[62] may be performed out of sequence.

[58] **WHEN** approximately 85 to 90% reactor power

OR when determined by Unit SRO (if power raised above 90%), **THEN**

ENSURE third condensate booster pump in service in accordance with 1,2-SO-2/3-1. [C.2] ________

NOTE

A nominal CBP suction pressure of approximately 180 psig, as indicated on **[PI-2-77]**, will alleviate bypassing to the condenser at full power.

[59] **IF** condensate pressure is high resulting in #3 or #7 heater drain tank bypassing to the condenser, **OR** the normal level control valves are near full open, **THEN**

[59.1] **THROTTLE** **[14-550]** to attain desired condensate pressure. ________

[59.2] **IF** unable to throttle **[14-550]**, **THEN**

REFER to 1,2-SO-5-2, Section 8.0 to adjust condensate pressure. ________

OR

EVALUATE removal of the condensate demineralizer booster pumps (N/A if NOT in service). ☐

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Two Cond DI Booster pumps must be started at the same time.

[60] **EVALUATE** starting available condensate demineralizer booster pump(s) to raise system pressure ~ 40 psig.

Pump Started YES ☐ NO ☐ _________

[61] **WHEN** reactor power is approximately 90%, **THEN**

PERFORM the following:

[61.1] **ADJUST** Power Range instrumentation in accordance with 0-SI-OPS-092-078.0. ☐

[61.2] **INITIATE** performance of 1-PI-OPS-000-020.1 or 2-PI-OPS-000-022.1, Appendix B. ☐

CAUTION

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

[61.3] **ENSURE** the following level controllers are maintaining levels within normal ranges:

A. Secondary plant heaters. _________

B. MSR drain tanks. _________

CAUTION

DO NOT exceed an average of 3455.0 MWT during an 8-hour period. [C.1]

[62] **MONITOR** NIS, ΔT and calorimetrics on plant computer (pt. U2118) while increasing reactor power. ☐

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Feedwater venturi unfouling may impact U1118 indication. LEFM calorimetric power (U2118) is not affected by venturi unfouling.
2) If U1118 is being used to monitor reactor power due to LEFM unavailable, then Calorimetric Calculation should be performed prior to exceeding 97% reactor power.
3) Steps 5.1[63] through 5.1[67] may be performed out of sequence.

[63] **IF** Unit is returning to full power after a turbine load reduction to less than 50%

AND U1118 is being used to monitor power,
THEN

PERFORM the following prior to exceeding 97% power:

[63.1] **NOTIFY** Systems Engineering to perform 0-PI-SXX-000-022.2, Calorimetric Calculation, Section 8.1, if necessary. ☐

[63.2] **PERFORM** applicable sections of 0-PI-SXX-000-022.2 to adjust Feedwater Flow Constant. (N/A if NOT required)

____
BOP Eng

NOTES

1) Ramp load rate increases shall be within the limits of TI-40
2) Intermediate Power Threshold ramp rate target value of 2% / hr may apply.

[64] **RECORD** power ascension ramp rate from TI-40. _________ ☐

[65] **CONTINUE** power ascension to 100% RTP. ☐

STARTUP No.__________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[66] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

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

[67] **MONITOR** the turbine load increasing **AND**

MAINTAIN valve position limit approximately 10% above the current governor control indication as turbine load is changed. ☐

> **NOTE**
>
> Steps 5.1[68] through 5.1[71] may be performed out of sequence.

[68] **WHEN** reactor power approaches 100%, **THEN**

ADJUST governor valve position limiter ~ 2% above governor valve position. ☐

> **NOTE**
>
> Engineering recommends placing the 3rd Condensate Demineralizer Booster Pump in service when at full power. Operation of only 2 Condensate Demineralizer Booster Pumps is allowed but reduces the operating margin in the event of a condensate transient based on the lower suction pressure to the MFPs.

[69] **IF** it is desired to place the 3rd condensate demineralizer booster pump in service, **THEN**
START 3rd condensate demineralizer booster pump in accordance with 1,2-SO-2/3-1. ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Governor valve position limit meter may NOT match the governor valve position meter; therefore, monitor the megawatt meter and valve position limit light continuously during the following step.

NOTES

1) Operation with the VALVE POS LIMIT light LIT is acceptable if unsatisfactory load swings are experienced.

2) Actions effecting reactivity are directed in the following step. All appropriate verifications and peer checks shall be utilized during performance.

[70] **IF** unsatisfactory load swings are experienced as the unit approaches full power, **THEN**

[70.1] **WITH** turbine load set for maximum of 100% power, **SLOWLY** and **CAUTIOUSLY PULSE** the governor VALVE POSITION LIMIT in LOWER direction while monitoring megawatts for a decrease and VALVE POS LIMIT light to ILLUMINATE. ☐

[70.2] **WHEN** the limiter just reaches the governor valve position,
THEN

STOP limiter adjustment. ☐

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Do not raise the limiter position unless the turbine control is positively controlling the turbine (limit light NOT LIT).

NOTE

Actions effecting reactivity are directed in the following step. All appropriate verifications and peer checks shall be utilized during performance.

[71] **PERFORM** the following if the limiter prevents reactor operation at approximately 100%:

[71.1] **ADJUST** SETTER/REFERENCE controls to reduce turbine loading until the VALVE POS LIMIT light is NOT LIT. ☐

[71.2] **INCREASE** VALVE POSITION LIMIT to allow a load increase using the SETTER/REFERENCE controls, NOT to exceed 3455.00 MWT. ☐

NOTES

1) Full power operation is defined as 100% power operation at approximately 3455 MW_T instantaneous value, U2118 not to exceed 3455.00 MW_T average thermal power in an 8-hour period. [C.1]

2) Do not intentionally operate the reactor at greater than 100% power (e.g., if reactor power is less than 100% for any time period then operation at slightly greater than 100% to "make up" for "lost" power is not permissible). [C.1]

3) Computer point U2118 should be trended on a trend recorder in the unit horseshoe and monitored for increasing reactor power trends above 3455 MW_T. Prompt action shall be taken to decrease reactor power whenever an increasing power trend is observed. [C.1]

4) Do not exceed an 8-hour average value (U2126) of 3455.00 MW_T. Do not allow U2125 (one hour avg) to exceed 3455.00 MW_T (100%) for more than one hour. [C.1]

5) Portions of step 5.1[73] may be performed in parallel with step5.1[72] if required.

[72] **WHEN** the unit stabilizes at 100% reactor power,
THEN

PERFORM the following: (may be performed in any order)

[72.1] **ADJUST** Governor Valve position, rod height, and/or RCS boron concentration as necessary to establish core thermal power at desired value and Auctioneered Hi T-avg approximately equal to T-ref. ☐

[72.2] **NOTIFY** load coordinator that the power increase is complete. ☐

[72.3] **NOTIFY** Radiation Protection that power has stabilized at 100%. ☐

(step continued on next page)

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Use of seal steam spillover bypass FCV-47-191 should be minimized to reduce the effect of unit trip on seal steam pressure.

[72.4] **IF** Seal Steam spillover bypass [FCV-47-191] is IN SERVICE, **THEN**

THROTTLE Seal Steam spillover bypass to control [FCV-47-191] as required to control seal steam pressure. ☐

[72.5] **IF** river temperature is less than 45°F, **THEN**

CONSULT Engineering to determine if third CCW pump should be removed from service. ☐

[72.6] **CONTACT** vibration engineer in Predictive Maintenance Group to monitor MFWP vibration. ☐

CAUTION

A bias adjustment in the upward direction (> 50% , Unit 1)(> +0, Unit 2) should NOT be used unless evaluated by Systems Engineering since this could impact a MFPT's maximum speed and the ability to fully load in the event the other MFPT trips.

[72.7] **IF** feed pump vibration is above desired levels, **THEN**
CONSULT with vibration engineer and system engineer to determine which feed pump to bias to reduce vibration. ☐

[72.8] **IF** MFPT master controller output is NOT indicating 45% to 55%
THEN
CONSULT with MFPT controls system engineer to evaluate if adjustment is required per 1,2-SO-2/3-1. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

[72.9] **IF** start up on Unit 2,
THEN
DETERMINE if CBP seal backpressure requires adjustment:

[72.9.1] **NOTIFY** Systems Engineering (BOP) to evaluate if adjustments are required on back pressure control valve 2-VLV-54-689. ☐

[72.9.2] **IF** System Engineer determines adjustment of 2-VLV-54-689 is needed,
THEN
ADJUST **[2-VLV-54-689]** as required to establish desired backpressure. ________

5.1 Power Ascension From 30% to 100% (continued)

[73] **IF** startup is following refueling activities, **THEN**

ENSURE the following are performed at approximately 100% Rated Thermal Power: (may be performed in any order)

[73.1] 0-PI-SXX-000-022.2, Calorimetric Calculation.

____
Systems Eng.

[73.2] 0-PI-SXX-000-022.1, Delta T and Tavg Update. [C.7]

____
Systems Eng.

[73.3] 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

_______________ _______________
Rx Eng Date

[73.4] 0-SI-NUC-000-120.0, Reactivity Balance.

_______________ _______________
Rx Eng Date

[73.5] 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

_______________ _______________
Rx Eng Date

[73.6] 0-PI-NUC-092-036.0, Incore-Excore Detector Calibration.

_______________ _______________
Rx Eng Date

[73.7] 0-PI-IXX-092-N45.0, PR NIS Calibration (May be N/A'd if Engineering determines calibration performed at < 75% RTP is adequate.)

____
Inst Maint

[73.8] Applicable portions of 0-RT-NUC-000-001.0 are complete for full power operations.

____
Rx Engr

STARTUP No._________ Unit _____ Date ________

5.2 At Power Conditions

CAUTIONS

1) **Full power operation is defined as approximately 3455 MWT NOT to exceed 3455.0 MWT averaged over an 8-hour period. [C.1]**

2) **Power shall NOT exceed one hour average (U2125) of 3455.00 MWT.**

3) **Power shall NOT exceed an 8-hour average value (U2126) of 3455.00 MWT (readings at 0700, 1500 and 2300 hours).**

NOTES

1) Failure to comply with the following NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.
2) The Transmission Operator shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]
3) The Transmission Operator shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.
4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.
5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.
6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made
7) 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 30 minutes.
8) Steps in this section may be performed out of sequence.

[1] **ENSURE** Section 3.0, Precautions and Limitations, have been reviewed. ________

[2] **TREND** Computer point U2118 on a trend recorder in the unit horseshoe and monitor for increasing reactor power trends above 3455 MW_T. ☐

Facility: Sequoyah		Scenario No.: 2	Op Test No.: 2012302
Examiners:		Operators:	

Initial Conditions: 100% stable

Turnover: 0-GO-5 Section 5.2, ‘At Power Conditions’ is in effect

Target CTs: Isolate the faulted SG before transition out of E-2 (Time Critical Action: AFW isolation)

Manually actuate at least the minimum complement of containment cooling equipment before an extreme (red-path) challenge develops to the containment CSF

Event No.	Malf. No.	Event Type*	Event Description
1. T+0	RW02A	C – BOP	A RCW Pp Trip w/ EHC Fluid Tank Temp Abnormal (High)
2. T+10	CV09	I – RO	VCT Level Transmitter 62-130-A Fails High
3. T+25	RX26G	I – BOP TS – SRO	#4 SG Press Ch 1 PT-1-27A Fails Low
4. T+35	AN_OV_179 ZDIHS255A ZDIHS245A	R – RO N – Crew	LP FW Htr String Isolation (Faulty High Level Switch)
5. T+20	SI11C	TS – SRO	RWST Level Channel LT-63-52 Fails Low (Tech Spec only)
6. T+55	CV04	C – RO N – Crew	CVCS Leak in Aux Building (on Letdown line; 90 gpm)
7. T+70	MS01B	M – All	#2 Main Steam Line Break Inside Containment
8. T+70	CS02A RP16K644B **[pre-insert]**	C – RO	1A Containment Spray Pump Sheared Shaft Containment Spray Pump 1B-B discharge Valve Auto Open Fails

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

Scenario 2 Summary

The crew assumes shift with the unit at 100% RTP, all systems' controls normal and in automatic as expected. 0-GO-5 Section 5.2, 'At Power Conditions' is in effect. Crew directions are to maintain 100% RTP.

Following completion of crew turnover and at the direction of the Lead Examiner, initiates 'A' RCW Pp Trip w/ EHC Fluid Tank Temp Abnormal (High). The crew will respond using alarm response procedure (ARP) 1 AR-M2-A B-2, 1-AR-M15-A B-7 that will direct the crew to AOP-M.05, Loss of Raw Cooling Water.

When the plant is stable, at Lead Examiner direction, initiate the next event, VCT Level Transmitter 62-130-A Fails High. The crew will respond using ARP 1-AR-M6-C A-3, which directs the actions for this failure including 1-SO-62-1 for manual make-up and VCT Divert Valve 1-LCV-62-118 control.

At Lead Examiner direction, initiate the next event, #4 SG Ch 1 PT-1-27A Fails Low The crew will respond using ARPs 1-AR-M6-B, D-2, D-3, D-7 directing entry into AOP-I.06, Steam Generator Instrument Malfunction, Section 2.1 for the instrument failure. The crew may respond to 1-AR-M5-A A-7, B-7 that will direct entry into AOP-S.01, Main Feedwater Malfunctions, Section 2.1, Unit 1 Failure of Automatic S/G Level Control; which will transition to AOP-I.06; this is also an acceptable procedural path in response to the alarms and indications presented. The SRO will identify Tech Specs: 3.3.2.1 Functional Unit 4.d, Action 17, 3.3.3.7 Functional Unit 8, Action 1.

At the Lead Examiner direction, initiate the next event, LP Feedwater Heater String Isolation. The crew will respond using alarm response procedures (ARPs) 1-AR-M2-C E-1 directing entry into AOP-S.04, Condensate or Heater Drains Malfunction, Section 2.3, Feedwater Heater String Isolation. The crew is expected to perform a plant power reduction to <86% power using either 0-GO-5, Normal Power Operation or AOP-C.03, Rapid Shutdown or Load Reduction for the LP heater string isolation.

At Lead Examiner direction, initiate the next event, RWST Level Channel LT-63-52 Fails Low. The crew will respond using ARPs 1-AR-M6-E E-3, E-4 that will direct entry into AOP-I.09, RWST Level Instrument Malfunction. Tech Spec event only, no crew action expected. The SRO will identify Tech Specs: 3.3.2.1 Functional Unit 9.a, Action 18.

When the plant is stable, at Lead Examiner direction, initiate the next event, CVCS Leak in Aux Building (on Letdown line). The crew will respond using ARPs 1-AR-M5-A C-3 and/or 1-AR-M6-C A-4, B-4, C-3 directing entry into AOP-R.05, Section 2.1, RCS Leak in Mode 1-3. The leak also challenges VCT inventory; therefore, the crew may decide to trip the plant once VCT inventory is depleted. If letdown isolation occurs first, terminating the leak, the crew may place Excess Letdown in service according to 1-SO-62-6, Excess Letdown as directed by the ARP for letdown line leak; or use EA-62-3, Establishing Excess Letdown directed by the AOP.

Insert the next event at the Lead Examiner direction, #2 Main Steam Line Break inside Containment occurs resulting in the crew decision to manually trip the reactor based on increasing reactor power with automatic rod motion, decreasing MG megawatts-electric and increasing Main Steam flow. If the crew tripped due to VCT inventory loss in AOP-R.05, the Main Steam Break should be inserted at the E-0 to ES-0.1 transition. The crew will carry out the immediate operator actions (IOAs) of E-0, Reactor Trip or Safety Injection proceed to ES-0.1 and back to E-0 based on either containment pressure or RCS pressure conditions and then transition to E-2, Faulted Steam Generator Isolation.

Following the Steam Break, containment pressure conditions will meet the automatic containment spray actuation setpoint. 1A -A Containment Spray Pump start results in a sheared-shaft condition; 1B-B Containment Pump will start but its discharge valve fails to open automatically requiring recognition and manual action to place at least 1 spray train in service.

Following the Reactor Trip the crew will identify a high containment pressure condition while monitoring Critical Safety Function Status Trees and transition from procedure/step currently in effect to FR-Z.1, High Containment Pressure. The crew will proceed through FR-Z.1 return to previous procedure/step in effect.

EOP flow: E-0 – ES-0.1 – E-0 – E-2 – FR-Z.1 – E-2

Scenario Termination: as directed by the Lead Examiner; Completion of E-2 Step 7.e, SI Termination criteria determination.

PSA significant task: Isolate Faulted Steam Generator
Isolate AFW to the faulted SG within 10 minutes after a steam line break
PSA significant component failure: 1A-A Containment Spray Pump
Steam line

NRC 1009 ESG-2 Booth Instruction File

8-10-2010

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
Simulator IC	**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:** **1009 NRC ESG-2** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms.	**100%, BOL ~150 MWD/MTU** **CB 'D' Rods @ 216 steps, all others @ 228 steps;** **[B] = 1120 ppm; Ba Blender setting: 27.5%** **Xe/Sm @ *equilibrium*** ***Console Operator actions: Place simulator in run and perform the following:*** • **Allow the simulator to run before loading SCEN file.** • **Place the MODE 1 sign on 1-M-4** • **Place Train Week A sign** • **Ensure A & B RCW Pumps in service.**
MFs, RFs, ORs are active when the SCN file is loaded.	**IMF CS02A f:1**	**1A-A Containment Spray Pump Sheared Shaft**
	IMF RP16K644B f:1	**1B-B Containment Spray Pump Discharge Valve Auto Open Fails**
1.	**IMF RW02A f:1 k:1** **IMF AN_OV_84 f:2 d:60 k:1**	**A RCW Pp Trip w/ TS-47-5 ELECTRO-HYD FLUID TANK TEMP ABNORMAL** *Support staff report: if dispatched, wait ~3 minutes, report as TB AUO from:* • *No apparent RCW Sys. water ruptures/leakage;* • *'A' RCW Pp- pump motor is hot to the touch;* • *480V UtBD area- A RCWP breaker open, Amptector Relay fault.* • *Local EHC Reservoir temperature ~135°F and heaters are off.* *Support staff report: If dispatched, AB AUO to AB El 734' behind the CCS Surge Tank to inspect the RCW Booster Pumps; field evaluation feedback - no problems*
INTRUCTOR NOTE: delete Malf after one standby RCW Pp is started	**DMF AN_OV_84 d:60**	**Simulates RCW system restoration.** *Support staff report: if dispatched, wait ~5 minutes, report as TB AUO that RCW system conditions are returning to normal (~110-115°F on EHC Temp.).*
2.	**IMF CV09 f:1 k:2**	**VCT Level Transmitter 62-130-A Fails High** *Support staff report: If dispatched to the Aux Control Room, report VCT Ch LT-62-129C reading '38'% (same as MCR indicator LI-62-129);* • *If MSS is contacted, inform the crew that I&C techs will report to the MCR in ~25 minutes.*
3.	**IMF RX26G f:0 r:30 k:3**	**#4 SG Ch 1 PressureTransmitter-1-27A Fails Low** *Support staff report: When MSS is contacted, inform the crew that I&C will report to the MCR in ~35 minutes.*

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
4.	IOR AN_OV_179 f:2 k:4 IOR ZDIHS255A f:0 d:10 k:4 IOR ZDIHS245A f:0 d:10 k:4	**LP FW Htr String Isolation** *Support staff report: When MSS is contacted, inform the crew that Mechanical or Electrical maintenance (whichever is requested) will report to the MCR in ~25 minutes.*
5.	IMF SI11C f:0 r:30 k:5	**RWST Level Channel LT-63-52 Fails Low** *Support staff report: When MSS is contacted, inform the crew that I&C will report to the MCR in ~35 minutes*
6.	IMF CV04 f:18 r:300 k:6 MMF CV04 f:100 r:600	**CVCS Leak in Aux Building (on Letdown line outside Containment)** *Support staff report: If dispatched, report as AB AUO*
7.	IMF MS01B f:10 r:120 k:7	**#2 Main Steam Line Break Inside Containment** *Support staff report: none*
8.	IMF CS02A f:1 IMF RP16K644B f:1 [Pre-insert]	**1A Containment Spray Pump Sheared Shaft** **Containment Spray Pump 1B-B discharge Valve Auto Open Fails** *Support staff report: none*
If dispatched to perform EA-32-1:	IRF IAR01 f:1 k:18 IRF IAR02 f:1 d:10 k:18	**Re-start A & B CACs**
If dispatched to perform EA-32-2:	IRF IAR06 f:1 d:15 k:28 IRF IAR07 f:1 d:20 k:28 IRF IAR08 f:1 d:25 k:28	**Restore Essential, Non-Essential CA to Containment, 1-FCVs-32-80, 102 and 110**
Termination Criteria: Completion of E-2 Step 7.e, SI Termination criteria determination		

SHIFT TURNOVER CHECKLIST Page 1. of 3 Today

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

Mode 1, 100% Power **PSA Risk: Green** **Grid Risk: Green** **RCS Leakage ID .14 gpm, UNID .05 gpm**	**NRC phone Authentication Code** **Until 0800 XXXX** **After 0800 YYYY**

Common Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner
- none -	**- none -**	**- - - - - - - - - -**	**- - - - - -**

U-1 Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner
- none -	**- none -**	**- - - - - - - - - -**	**- - - - - -**

Protected Equipment

Shift Priorities

- Daily and Shiftly SIs per work schedule

Part 2 – Performed by on-coming shift

☐ Verify your current qualifications

☐ Review Operating Log since last held shift or 3 days, whichever is less

☐ ODMIs / Standing Orders / Shift Orders

☐ TACFs

☐ Immediate required reading

☐ LCO Actions

☐ Integrated Schedule Reviewed for the shift (SRO only)

☐ Active procedures file (within 1 hour of assuming shift)

☐ PERs (applicable to this unit)

☐ Operator workarounds, burdens, and challenges

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

☐ Walk down of MCR Control Boards

SHIFT TURNOVER CHECKLIST Page 2. of 3 Today

MAIN CONTROL ROOM (7690)

- **Train _A_ Week**

OUTSIDE (7666) [593-5214]

AUXILIARY BUILDING (7775)

TURBINE BUILDING (7771) (593-8455)

SHIFT TURNOVER CHECKLIST Page 3. of 3 Today

Disabled Annunciators

PANEL	WINDOW	ANNUNCIATOR	WO / PER Number

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number

MCR WO LIST

ID And Noun Name	Panel	Problem Description	WO/PER Number

Operations Chemistry Information

Boron Results

Sample Point	Units	Boron	Date / Time	Goal	Limit
U1 RCS	ppm	1120	Today / Now	Variable	Variable
U2 RCS	ppm	648	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	1.8	Today / Now	1.69-1.89	1.79
U2 RCS Lithium	ppm	3.49	Today / Now	3.39-3.69	3.54

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	115	Today / Now	68	Today / Now
15 gpd (30 min increase)	cpm	265	Today / Now	83	Today / Now
30 gpd leak equivalent	cpm	490	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	1165	Today / Now	455	Today / Now
150 gpd leak equivalent	cpm	2290	Today / Now	870	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cfm	40	Today / Now	40	Today / Now

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

Op Test No.:	NRC 2010302	Scenario #	2	Event #	1	Page	1 of 61

Event Description: 1A RCW Pp Trip, Stby Pump Auto-Start Failure w/ EHC Fluid Tank Temp Abnormal (High)

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or behavior</th></tr>
<tr><td colspan="3">Simulator Operator: at Lead Examiner direction, insert Event 1</td></tr>
<tr><td colspan="3">Indications/Alarms
Annunciators:
1-M-15
• 1-XA-55-15A B-7, "MOTOR TRIPOUT"
Indications:
1-M-15
• 0-PI-24-22, RCW HEADER PRESSURE decreased to ~60-63 psig
Significant Resultant Alarms/Indications:
1-M-2
• 1-XA-55-2A B-2, "TS-47-5 ELECTRO-HYD FLUID TANK TEMP ABNORMAL"</td></tr>
<tr><td>T = 0</td><td colspan="2">Following completion of crew turnover, w/ A & B RCW Pumps in service, crew directions are to maintain 100% RTP</td></tr>
<tr><td></td><td>BOP</td><td>Identifies 1-AR-M15-A B-7, "MOTOR TRIPOUT" acknowledges alarm, places 'A' RCW handswitch, 0-HS-24-7A in "STOP-PULL-TO-LOCK" and, notifies SRO</td></tr>
<tr><td></td><td>BOP</td><td>Diagnoses 'A' RCW Pump trip, standby RCW Pump start not required.

On 1-M-15, 0-PI-24-22: 70-78 psig Normal RCW Header Pressure;
System pressure will fall to 60-63 psig;
Auto-Start Setpoint: 35 psig decreasing</td></tr>
<tr><td></td><td>BOP</td><td>Refers to and implements Motor Tripout alarm ARP Step 3:

[3] IF RCW pump is tripped, THEN
[a] DISPATCH operator to that piece of equipment or breaker compartment to determine cause of tripout.
[b] REFER to AOP-M.05, Loss of Raw Cooling Water.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO</td><td>Enters AOP-M.05, Loss of Raw Cooling Water</td></tr>
<tr><td></td><td></td><td>1. DISPATCH operators with radios to the Turbine Building to perform the following:</td></tr>
<tr><td></td><td></td><td>a. DETERMINE whether RCW header INTACT.</td></tr>
<tr><td></td><td></td><td>b. EVALUATE need to START additional Turbine Building sump pumps. [TB el. 662]</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 2 Event # 1 Page 2 of 61

Event Description: 1A RCW Pp Trip, Stby Pump Auto-Start Failure w/ EHC Fluid Tank Temp Abnormal (High)

Time	Position	Applicant's Actions or behavior
	CAUTION: 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: Glycol chiller package operation is interlocked with raw cooling water pressure. Chiller packages may stop and start if pressure is oscillating.	
		2. CHECK PI-24-22, RCW header pressure greater than or equal to 68 psig. *(RNO required)*
		RNO: **PERFORM** the following:
	BOP	a. **START** additional RCW pumps as necessary. [1-M-15]
Evaluator Note: Following the RCW Pump start, restoring system conditions to normal, SRO may choose not to align ERCW due to Tech Spec implications.		
	BOP	b. **ENSURE** ERCW cooling aligned to Station Air Compressors:
		1) **OPEN** [0-FCV-67-208] 1B ERCW Supply Header Isolation [M-27A].
		2) **IF** 1B ERCW Supply to Station Air Compressors is unavailable, **THEN OPEN** [0-FCV-67-205] 1A Supply Header Isolation
	BOP	c. **DISPATCH** operators to the glycol chillers and **EVALUATE** need for chiller(s) SHUTDOWN.
	BOP	3. **MONITOR** control air header pressure greater than 88 psig. [0-PI-32-200, 1-M-15]
	BOP	4. **MONITOR** GEN STATOR TEMPERATURE HIGH alarm DARK [M-1A, A-1]. **Annunciator Dark**

Op Test No.: NRC 2010302 Scenario # 2 Event # 1 Page 3 of 61

Event Description: 1A RCW Pp Trip, Stby Pump Auto-Start Failure w/ EHC Fluid Tank Temp Abnormal (High)

Time	Position	Applicant's Actions or behavior
	BOP	5. **MONITOR** GEN LEADS BUS CLR AIR TEMP HIGH alarm DARK [M-1B, E-2]. **Annunciator Dark**
	BOP/ SRO	6. **MONITOR** ability to maintain unit operation based on RCW capabilities. **RCW Sys Capabilities restored by pump start in Step 2 RNO a.**
	SRO	7. **SHUTDOWN** equipment cooled by RCW as necessary. **Determines further equipment shutdown not necessary**
	CREW	8. **MONITOR** temperatures associated with the following equipment NORMAL: **Determines load reduction not necessary**
Evaluator Note:	SRO/BOP dispatched the AB AUO to AB El 734' behind the U1 side CCS Surge Tank to inspect the RCW Booster Pumps; field evaluation feedback - no problems	
	SRO	9. **CHECK** RCW booster pumps for PROPER OPERATION.
		• Suction pressure. • Discharge pressure. • No signs of cavitation. • No signs of pump run out.
	SRO	10. **DETERMINE** whether CCW pump(s) are feeding a rupture and should be stopped.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	1	Page	4 of 61

Event Description: 1A RCW Pp Trip, Stby Pump Auto-Start Failure w/ EHC Fluid Tank Temp Abnormal (High)

Time	Position	Applicant's Actions or behavior
	SRO	11. **INITIATE** repairs, and **GO TO** appropriate plant procedure.
Evaluator Note:		The following CREW Brief and Notification actions are not contained in the procedure.
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 the CREW has restored RCW and EHC temperature returns to normal.		

Op Test No.: NRC 2010302 Scenario # 2 Event # 2 Page 5 of 61

Event Description: VCT Level Transmitter 62-130-A Fails High

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 2		
Indications/Annunciation: **Annunciators:** **1-M-6** • **1-XX-55-6C A-3, "LS-62-129A/B VOLUME CONTROL TANK LEVEL HI-LOW** **Indications:** **1-M-6** • **1-LI-62-129, VCT LEVEL indicates full scale, 100%** • **1-HS-62-118A, LETDOWN DIVERT TO HUT**		
T = 10	RO	Identifies 1-XX-55-6C A-3, "LS-62-129A/B VOLUME CONTROL TANK LEVEL HI-LOW" acknowledges alarm and, notifies SRO:
	RO	Diagnoses VCT Level instrument failure, **Probable Causes**: 1. High Level [a] VCT divert valve malfunction or misaligned. [b] Letdown flow rate greater than makeup flow rate. [c] 1-LT-62-130A failing high.
	RO	Refers to and implements Volume Control Tank Level alarm ARP starting at Step 1:
	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.
	NOTE 5:	Symptom of partial loss of reference leg 1-LT-62-130A and -130C. Log point L0112A (1-LT-62-130A) indicating higher than 1-LI-62-129 (1-M-6) and 1-LI-62-129C (1-L-10). **[C.5]**
		[1] COMPARE indicated level between **[1-LI-62-129]** (1-M-6) and ICS computer point **L0112A** (1-LT-62-130).

Op Test No.: NRC 2010302 Scenario # 2 Event # 2 Page 6 of 61

Event Description: VCT Level Transmitter 62-130-A Fails High

Time	Position	Applicant's Actions or Behavior
	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. Operator places **1-HS-62-118A** in the **'V.C. Tk'** position
	RO	**[6] IF HIGH** level, **THEN** **[a] ENSURE [1-LCV-62-118]** aligned to HUT. **[b] STOP** VCT makeup Operator verifies **1-HS-62-118A** in the **'V.C. Tk'** position, proper VCT level (~20-44%) and no make-up in progress.
	SRO/ Crew	**[8] IF** a small RCS leak is indicated, **THEN GO TO** AOP-R.05, RCS Leak and Leak Source Identification. **[9] EVALUATE** EPIP-1, Emergency Plan Class Matrix. **No action required.**
Evaluator Note:		The following CREW Brief and Notification actions are not contained in the procedure.
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief. <u>Operations Management</u> - Typically Shift Manager. <u>Maintenance Personnel</u> – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Lead Examiner may cue next event when VCT level stable and make-up capability determined.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	3	Page	7 of 61
Event Description:	#4 SG Ch 1 PT-1-27A Fails High						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 3		
Indications/Alarms **Annunciators:** **1-M-5** • **1-XA-55-5A A-7, "FS-3-35A STEAM GEN FEEDWATER FLOW HIGH"** • **B-7, "LS-3-42D STEAM GEN LVL HIGH-LOW DEVIATION"** **1-M-6** • **1-XA-55-6B D-2, "PS-1-27AN LOW STEAMLINE PRESSURE LOOP 4"** • **D-3, "PS-1-27AR HIGH NEGATIVE RATE STEAMLINE PRESSURE LOOP 4** **Indications:** **1-M-4** • **1-PI-1-27A, SG-4 PRESSURE:** indicator trending to or at '0' scale; • **1-FI-3-103A, 103B SG-4 INLET FLOW CH-1, 2:** increasing feed flow greater than steam flow trend;		
T + 20	BOP	Identifies 1-PI-1-27A, SG-4 PRESSURE indicator trending upscale, and #4 SG Feed flow increasing and notifies SRO:
	RO	Monitors reactor stable and refers to and assists with associated ARP implementation (for alarms listed above).
	BOP	Diagnoses #4 SG Pressure instrument upscale failure; On 1-M-3, identifies #4 SG FRV demand increasing and position indication moving 'OPEN'
	BOP	Implements AOP-S.01 Section 2.1 Step 1 Immediate Operator Actions (IOAs) as defined in EPM-4, User's Guide
		AOP-S.01, Main Feedwater Malfunctions, **Section 2.1, Unit 1 Failure of Automatic S/G Level Control;**
	NOTE Step 1 is an IMMEDIATE ACTION.	
	BOP	1. **RESTORE** steam generator level(s):
		a. **PLACE** affected feedwater reg valve controller(s) in MANUAL.
		b. **CONTROL** feedwater flow on affected S/G(s) to restore level to program.
	BOP	2. **CHECK** S/G pressure instruments NORMAL. ***(RNO required)***

Op Test No.:	NRC 2010302	Scenario #	2	Event #	3	Page	8 of 61
Event Description:	#4 SG Ch 1 PT-1-27A Fails High						

Time	Position	Applicant's Actions or Behavior
		RNO: **IF** any S/G pressure instrument has failed, **THEN GO TO** AOP-I.06, Steam Generator Instrument Malfunction
	SRO	Transitions to AOP-I.06, Steam Generator Instrument Malfunction Section 2.1, Unit 1 S/G (Steamline) Pressure Instrument Malfunction
		AOP-I.06, Steam Generator Instrument Malfunction **Unit 1 S/G (Steamline) Pressure Instrument Malfunction**
	NOTE: Channels I and II steam pressure instruments provide compensation to steam flow signals which input to S/G Water Level Control.	
	BOP	1. **VERIFY** unaffected steam flow channel SELECTED:
		• S/G #1: 1-XS-1-3D • S/G #2: 1-XS-1-10D • S/G #3: 1-XS-1-21D • S/G #4: 1-XS-1-28D. ***(RNO required)***
	BOP	**RNO:** **PERFORM** the following:
		a. **ENSURE** affected level controller(s) in MANUAL:
		• S/G #1: 1-FIC-3-35A • S/G #2: 1-FIC-3-48A • S/G #3: 1-FIC-3-90A • S/G #4: 1-FIC-3-103A.
	BOP	b. **MATCH** steam flow and feedwater flow on affected S/G **USING** MFW reg valve

Op Test No.: NRC 2010302 Scenario # 2 Event # 3 Page 9 of 61

Event Description: #4 SG Ch 1 PT-1-27A Fails High

Time	Position	Applicant's Actions or Behavior
	BOP	c. **TRANSFER** associated Steam Flow selector switch to alternate channel:

LOOP	TRANSFER SWITCH	FLOW INDICATOR
S/G #1	1-XS-1-3D	FI-1-3A
		FI-1-3B
S/G #2	1-XS-1-10D	FI-1-10A
		FI-1-10B
S/G #3	1-XS-1-21D	FI-1-21A
		FI-1-21B
S/G #4	1-XS-1-28D	FI-1-28A
		FI-1-28B

Time	Position	Applicant's Actions or Behavior
	BOP	d. **MAINTAIN** steam generator level(s) on program.
	BOP	e. **IF** auto control of affected MFW reg valve(s) is available, **THEN PLACE** MFW reg valve(s) in AUTO.
	SRO	2. **EVALUATE** the following Tech Specs for applicability:
		3.3.2.1, ESFAS Instrumentation Functional Unit 4.d Steam Line Pressure-Low- Action 17: w/ OPERABLE Chs 1 less than Total, SU and/or PWR OPs may proceed provided: a. INOPERABLE Ch tripped w/i 6 hrs. b. Minimum Chs OPERABLE met; however, INOPERABLE Ch bypassed up to 4 hrs for surveillance testing of other Chs per 4.3.2.1.1.
		• 3.3.3.5, Remote Shutdown Instrumentation – NOTE 1- Not Applicable
		• 3.3.3.7, Accident Monitoring Instrumentation Instrument 8 – **Action 1.a**: w/ # of chs 1 less than minimum required, restore to OPERABLE w/i 30 days or HT STBY w/i 6 hrs, in HT SHDN w/i next 6 hrs.
	NOTE: If performing AOP in conjunction with AOP-I.11 for Eagle LCP failure… **(SRO determines NOTE not applicable)**	

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Event Description: #4 SG Ch 1 PT-1-27A Fails High

Time	Position	Applicant's Actions or Behavior
	SRO	3. **NOTIFY** I&C to remove failed S/G pressure instrument from service **USING** appropriate Appendix:

LOOP	INSTRUMENT NUMBER	PROT CH	APPENDIX
1	P-1-2A (P-514)	I	A
	P-1-2B (P-515)	II	B
	P-1-5 (P-516)	IV	C
2	P-1-9A (P-524)	I	D
	P-1-9B (P-525)	II	E
	P-1-12 (P-526)	III	F
3	P-1-20A (P-534)	I	G
	P-1-20B (P-535)	II	H
	P-1-23 (P-536)	III	I
4	P-1-27A (P-544)	I	J
	P-1-27B (P-545)	II	K
	P-1-30 (P-546)	IV	L

	NOTE: Core thermal power indication (U1118 and U2118) is NOT expected to be impacted by failure of a single steam pressure instrument.	
		4. **CHECK** ICS point U2118 OPERABLE.
	SRO	5. **GO TO** appropriate plant procedure.
		END OF SECTION
Evaluator Note:	The following CREW Brief and Notification actions are not contained in the procedure.	
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief. Operations Management - Typically Shift Manager.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	3	Page	11 of 61

Event Description: #4 SG Ch 1 PT-1-27A Fails High

Time	Position	Applicant's Actions or Behavior
		Maintenance Personnel – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Lead Examiner may cue next event when an OPERABLE steam flow channel is selected, affected Feed Reg Valve returned to automatic control and Tech Specs have been identified.

Op Test No.: NRC 2010302 Scenario # 2 Event # 4 Page 12 of 61

Event Description: LP FW Htr String Isolation (Faulty High Level Switch)

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 4		
Indications/Alarms **Annunciators:** **1-M-2** • **1-XA-55-2-C E-1, "LS-6-138A HEATER NO A6 LEVEL ABNORMAL"** **Significant Resultant Alarms/Indications:** **1-M-3** • **1-PI-2-129, MFP INLET PRESS indicator trending down** • **1-PI-2-77, CBP SUCTION PRESS indicator trending down**		
T = 30	BOP	Identifies 1-XA-55-2-C E-1, "LS-6-138A HEATER NO A6 LEVEL ABNORMAL" acknowledges alarm and LP FW Htr String Isolation Valves 1-FCV-2-45 & 55 in mid-position/closed on 1-HS-2-45A & 55A RED/GREEN lights and notifies SRO
	BOP	Diagnoses (on 1-M-3) 1 train of Low Pressure Heaters isolated & Implements 1-AR-M2-C E-1 ARP:
	BOP	**[1] DISPATCH** operator to heater to determine if level is high or low via sightglass.
	RO	Monitors reactor power stable and refers to/assists with associated ARP implementation.
	BOP	**[2] VERIFY** proper operation of LCV's and controllers.
	BOP	**[3] IF** level is high, **THEN**… (waits on report from field operator)
		[4] IF heaters A-5, A-6, and A-7 isolate, **THEN GO TO** AOP-S.04, *Condensate or Heater Drains Malfunction.*
	SRO/BOP	Implements AOP-S.04, Condensate Or Heater Drains Malfunction
		AOP-S.04, Condensate or Heater Drains Malfunction, Section 2.3 Feedwater Heater String Isolation
		1. **ENSURE** affected heater string ISOLATED:
	BOP	• Condensate inlet isolation valve CLOSED. **Positions 1-HS-2-45A to CLOSE to comply**

Op Test No.: NRC 2010302 Scenario # 2 Event # 4 Page 13 of 61

Event Description: LP FW Htr String Isolation (Faulty High Level Switch)

Time	Position	Applicant's Actions or Behavior
	BOP	• Condensate outlet isolation valve CLOSED.
	SRO	• Extraction steam isolation valve(s) CLOSED. (NOT applicable for low pressure heater strings) **Step not applicable**
	BOP	2. **MONITOR** condensate flowpath:
		a. **CHECK** for isolation of all three heater strings. ***(RNO required)***
		RNO: a. **GO TO** Caution prior to Step 3.
	CAUTION: Feedwater temperature changes may impact core thermal power.	
	BOP	3. **MONITOR** Steam generator levels returning to program. [M-4]
	RO	4. **MONITOR** reactor power:
		a. **CHECK** ICS thermal power indication AVAILABLE.
	RO	b. **REDUCE** turbine load as necessary to maintain 10 minute average power less than applicable limit (3455 or 3411 MWt). **Notifies SRO actual core power exceeding RTP limits indicated on ICS**
Evaluator Note: Due to the loss of the single string of low pressure feedwater heaters, core thermal power will exceed the 100% RTP limit. Load adjustment will be necessary. The crew may choose to lower plant power now by small MT load decreases.		
	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.	
	NOTE: Severe MFW pump cavitation is likely if inlet pressure is less than 250 psig.	
		5. **MONITOR** Feedwater pump inlet pressure greater than 320 psig. [M-3, PI-2-129]
		6. **MONITOR** Condensate Booster pump suction pressure greater than 100 psig. [M-3, PI-2-77]
Evaluator Note: Plant power reduction to <86% will be required to comply with the following step. The crew should chose AOP-C.03, Rapid shutdown or Load Reduction. AOP-C.03 steps follow this event guide.		
	NOTE: Power reduction is required based on LP turbine limitations. Recommended load rate is 1% per minute if turbine load reduction is needed.	

Op Test No.:	NRC 2010302	Scenario #	2	Event #	4	Page	14	of 61

Event Description: LP FW Htr String Isolation (Faulty High Level Switch)

Time	Position	Applicant's Actions or Behavior
	SRO/ Crew	7. **IF** Low Pressure Heater String has isolated, **THEN INITIATE** turbine load reduction to less than 86% (Unit 1) or 90% (Unit 2) **USING** one of the following:
		• 0-GO-5, Normal Power Operation **OR** • AOP-C.03, Rapid shutdown or Load Reduction.
	BOP	8. **DISPATCH** an operator to check heater levels and investigate cause of isolation. [TB el. 706' and 685']
	Crew	9. **NOTIFY** Maintenance to investigate and initiate repair of affected equipment.
	SRO/ BOP	10. **REFER TO** applicable section of 1,2-SO-5-1, Feedwater Heaters and Moisture Separator Reheaters.
	SRO	11. **GO TO** appropriate plant procedure.
		END OF SECTION
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief. <u>Operations Management</u> - Typically Shift Manager. <u>Maintenance Personnel</u> – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).
Lead Examiner may cue the next event when plant power is lowered to <86% RTP.		

Op Test No.: NRC 2010302 Scenario # 2 Event # 4 Page 15 of 61

Event Description: LP FW Htr String Isolation (Faulty High Level Switch)

AOP-C.03, Rapid Shutdown or Load Reduction

Time	Position	Applicant's Actions or Behavior
	SRO	1. ENSURE CREW has been briefed on reactivity management expectations USING Appendix E. SRO determines plant power reduction rate. According to AOP-C.03, that rate may be 1-4%/minute; and may be varied during the power reduction/ shutdown based on SRO determination/direction.
Evaluator Note: **AOP-S.04 Section 2.3 Step 7 NOTE:** Power reduction is required based on LP turbine limitations. Recommended load rate is 1% per minute if turbine load reduction is needed. SRO, crew should select 1% load rate change for this power change.		
c		
	CREW	2. NOTIFY following personnel of rapid shutdown or load reduction: • Load Coordinator • Chemistry • RADCON • Plant Management
	CREW	3. MONITOR reactor/turbine trip NOT required USING Appendix A, Reactor and Turbine Trip Criteria.
	BOP	4. CHECK VALVE POSITION LIMIT light DARK on EHC panel. [M-2]
	If Necessary: BOP	**RNO:** **RESTORE** turbine control **USING** Appendix C, Turbine Runback Restoration.
	NOTE: BAT is preferred boration source. Boration volume and flowrates listed in following step are recommendations and may be adjusted as necessary.	
	RO	5. 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 OR • volume recommended by Reactor Engineering

Op Test No.:	NRC 2010302	Scenario #	2	Event #	4	Page	16 of 61
Event Description:	LP FW Htr String Isolation (Faulty High Level Switch)						

AOP-C.03, Rapid Shutdown or Load Reduction

Time	Position	Applicant's Actions or Behavior
	RO/ SRO	b. DETERMINE recommended boration flowrate from table below or from Reactor Engineering:
	SRO	c. ENSURE concurrence obtained from US and STA for boration volume and flowrate.
	RO	d. PLACE boric acid transfer pump aligned to blender in FAST speed.
	RO	e. ADJUST FCV-62-138 to establish desired flow rate.
		f. **CONTROL** boration flow as required to inject desired boric acid volume.
	RO	g. GO TO Step 7.
	SRO	7. INITIATE load reduction as follows:
	BOP	a. ADJUST load rate to desired value: • between 1% and 4% per minute if borating via FCV-62-138 OR • between 1% and 3% per minute if borating via normal boration (App. D) OR • 2% or 3% per minute if borating from RWST.

Table for step b:

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

Op Test No.: NRC 2010302 Scenario # 2 Event # 4 Page 17 of 61

Event Description: LP FW Htr String Isolation (Faulty High Level Switch)

<table>
<tr><th colspan="3">AOP-C.03, Rapid Shutdown or Load Reduction</th></tr>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td>BOP</td><td>b. ADJUST setter for desired power level:<table>
<tr><th>DESIRED RX POWER LEVEL</th><th>RECOMMENDED SETTER VALUE</th></tr>
<tr><td>90%</td><td>76</td></tr>
<tr><td>80%</td><td>56</td></tr>
<tr><td>70%</td><td>46</td></tr>
<tr><td>60%</td><td>40</td></tr>
<tr><td>50%</td><td>35</td></tr>
<tr><td>40%</td><td>30</td></tr>
<tr><td>30%</td><td>25</td></tr>
<tr><td>20% or less</td><td>15</td></tr>
</table></td></tr>
<tr><td></td><td>BOP</td><td>c. INITIATE turbine load reduction by depressing GO pushbutton.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO/
BOP</td><td>d. CONTROL turbine load reduction as necessary to reduce power to desired level.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO</td><td>8. 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.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP</td><td>9. MONITOR automatic control of MFW pump speed AVAILABLE.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP</td><td>10. STOP secondary plant equipment USING Appendix B, Secondary Plant Equipment.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE: if LEFM thermal power (U2118) is inoperable, 3 steps must raise rod insertion limit curve. Rod insertion limit alarms and ICS display are NOT automatically adjusted when LEFM is inoperable.</td></tr>
<tr><td></td><td>RO</td><td>11. MONITOR control rods above low-low insertion limit USING ICS or COLR.</td></tr>
</table>

Op Test No.:	NRC 2010302	Scenario #	2	Event #	4	Page	18 of 61
Event Description:	LP FW Htr String Isolation (Faulty High Level Switch)						

AOP-C.03, Rapid Shutdown or Load Reduction

Time	Position	Applicant's Actions or Behavior
	NOTE: Initiating plant shutdown required by Tech Specs requires 4-hour NRC notification per SPP-3.5, Regulatory Reporting Requirements.	
	SRO	12. 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
		13. EVALUATE EPIP-1, Emergency Plan Initiating Conditions Matrix.
	RO	14. PERFORM the following to reduce boron concentration difference between Pzr and RCS loops:
	RO	a. CHECK at least one normal spray valve AVAILABLE
	RO	b. ENSURE at least one backup heater group ENERGIZED.
	RO	c. ENSURE spray valve(s) responds to control RCS pressure.
	CREW	15. 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.
	CREW	16. MONITOR if turbine load reduction can be stopped:
	SRO	a. CHECK the following conditions met:
		• reactor shutdown is NOT needed • turbine shutdown is NOT needed • turbine load at desired power level (further load reduction NOT needed)
	BOP	b. STOP turbine load reduction by depressing HOLD.
	RO	c. WHEN control rods are above the low-low insertion limit, THEN STOP boration flow.

Op Test No.: NRC 2010302 Scenario # 2 Event # 4 Page 19 of 61

Event Description: LP FW Htr String Isolation (Faulty High Level Switch)

AOP-C.03, Rapid Shutdown or Load Reduction

Time	Position	Applicant's Actions or Behavior
	CREW	d. NOTIFY Chem Lab to sample RCS for boron concentration.
		e. T-avg within 3°F of T-ref USING one of the following: • AUTO or MANUAL rod control • dilution or boration USING 0-SO-62-7.
	RO	f. CHECK reactor power greater than 50%.
	RO/ SRO	g. DETERMINE Tech Spec AFD limits for current power level USING ICS (Primary Mimics, Doghouse Display) or COLR.
	RO	h. CHECK AFD within Tech Spec limits on at least three operable power range NIS channels.
	RO/ SRO	I. IF AFD is outside target band, THEN INITIATE 0-SI-NUC-000-044.0, Axial Flux Difference.
	SRO	J. INITIATE performance of 0-SI-OPS-092-078.0, Power Range Neutron Flux Channel Calibration By Heat Balance Comparison.
	BOP	k. CHECK C-7 LOSS OF LOAD INTERLOCK [M-4A window E-5] DARK.
	NOTE: Time in core life, expected Xenon changes, and planned power changes should be considered when evaluating need for boration or dilution.	
	SRO	L. CONSULT Reactor Engineering and STA regarding ΔI control and compensating for Xe changes.
	SRO/ RO	m. PERFORM the following as necessary to control ΔI and maintain T-avg on program: • INITIATE boration or dilution as necessary USING 0-SO-62-7, Boron Concentration Control OR • OPERATE control rods as necessary.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	4	Page	20 of 61
Event Description:	LP FW Htr String Isolation (Faulty High Level Switch)						

AOP-C.03, Rapid Shutdown or Load Reduction

Time	Position	Applicant's Actions or Behavior
	RO	n. CHECK at least one normal Pzr spray valve OPERABLE
	SRO	o. DETERMINE appropriate procedure based upon power level and cause of rapid shutdown:
		• Other applicable AOP OR • 0-GO-5, Normal Power Operation (if greater than approximately 30% power) OR • 0-GO-4, Power Ascension from Less than 5% to 30% Power (if less than approximately 30%)
	SRO	p. GO TO appropriate plant instruction.

Evaluator Note: SRO/CREW may conduct a brief at this time and should return/ensure reactor power is stable per AOP-S.06, Turbine Trip Below P-9 (50% Power).

Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.

		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief. <u>Operations Management</u> - Typically Shift Manager. <u>Maintenance Personnel</u> – Typically Maintenance Shift Supervisor (MSS) (**Note:** Maintenance notification may be delegated to the Shift Manager).

Lead Examiner may cue next event when the CREW has stabilized plant power.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	5	Page	21 of 61
Event Description:	RWST Level Channel LT-63-52 Fails Low (Tech Spec only)						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 4		
Indications/Alarms **Annunciator:** **1-M-6** • **1-XA-55-6-E, E-3 "LS-63-50A RWST LVL LO"** • **1-XA-55-6-E, E-4 "LS-63-50A RWST LVL LO-LO"** **Indications:** **1-M-6** • **1-LT-63-52, RWST LEVEL WIDE RANGE trending downscale/at '0'%**		
Evaluator Note: No Plant transient occurs, indications/alarms only.		
	RO	Identifies alarm 1-XA-55-6-E E3, E-4, ""LS-63-50A RWST LVL LO" and RWST LO-LO", acknowledges alarms and notifies SRO
	SRO	Direct entry to AOP-I.09, RWST Level Instrument Malfunction.
		AOP-I.09, RWST Level Instrument Malfunction
	SRO	1. **EVALUATE** the following Tech Specs for applicability:
		• 3.3.2.1, ESFAS Instrumentation Table 3.3-3 Functional Unit 9.a, **Action 9.a**: w/ number of OPERABLE Chs 1 less than total, ops may proceed provided inoperable Ch in bypassed condition w/i 6 hrs & Min Chs OPERABLE rqt met; 1 additional Ch may be bypassed up to 4 hrs for surveillance testing per Spec 4.3.2.1.1. • 3.3.3.7, Accident Monitoring Instrumentation – N/A for this instrument.
	Crew	2. **NOTIFY** IM to remove failed level instrument from service **USING** appropriate Appendix: L-63-52 – Ch III - Appendix C
	SRO	3. **GO TO** appropriate plant procedure.
When Technical Specifications are addressed, the Lead Examiner may cue the next event		

Op Test No.: NRC 2010302 Scenario # 2 Event # 6 Page 22 of 61

Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

Simulator Operator: When directed, initiate Event 5

Indications/Alarms

Annunciators:

1-M-5

- **1-XA-55-5A C-3, "LS-68-335D/E PRESSURIZER LEVEL HIGH-LOW"**

1-M-6

- **1-XA-55-6C A-4, "TS-62-78 LTDN HX OUTLET TO DEMIN TEMP HIGH"**
- **B-4, "FS-62-82 LOW PRESS LTDN FLOW HIGH PRESSURE HIGH"**
- **C-3, "PS-62-122A/B VOLUME CONTROL TANK PRESS HI-LOW"**

Indications:

1-M-6

- **1-TI-62-78, LETDOWN HX OULTLET TEMP decreasing;**
- **1-PI-62-81, LETDOWN HX OUTLET PRESSURE decreasing;**
- **1-FI-62-82, LETDOWN HX OUTLET FLOW decreasing;**

Significant Resultant Alarms/Indications:

1-M-6

- **1-LI-62-129, VCT LEVEL trending down**
- **1-XA-55-6C A-3, "LS-62-129A/B VOLUME CONTROL TANK LEVEL HI-LOW"**

Time	Position	Applicant's Actions or Behavior
T = 65	RO	Identifies lowering VCT level and increasing charging flow; notifies SRO
	BOP	Monitors plant stable and refers to/assists with associated ARP implementation.
	RO	Determines loss of RCS inventory, implements 1-AR-M5-A C-3 ARP and refers SRO to AOP-R.05, RCS Leak and Leak Source Identification.
	SRO	Enters AOP-R.05, RCS Leak and Leak Source Identification Section 2.1, RCS Leak in MODE 1-3

Op Test No.: NRC 2010302 Scenario # 2 Event # 6 Page 23 of 61

Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

Time	Position	Applicant's Actions or Behavior
	RO	1. **CONTROL** charging flow using one CCP:
		- **ADJUST** FCV-62-93 and FCV-62-89 as necessary to maintain pzr level on program. - **MAINTAIN** seal injection flow at least 6 gpm to each RCP.
	RO	2. **MONITOR** pressurizer level STABLE or RISING. ***(RNO required)***
	RO	**RNO:** **IF** sufficient time is available, **THEN ISOLATE** normal and excess letdown:
		a. **ENSURE** FCV-62-72, 73, and 74 CLOSED. b. **CLOSE** FCV-62-69 and 70. c. **ENSURE** FCV-62-54 and 55 CLOSED.
	RO/ SRO	**IF loss of pressurizer level is imminent OR low pressure reactor trip (1970 psig) is imminent, THEN PERFORM the following:**
		a. **TRIP** the reactor. b. **INITIATE** Safety Injection. c. GO TO E-0, Reactor Trip or Safety Injection.
	RO	3. **MONITOR** containment pressure STABLE or DROPPING. **Determines no effect on containment pressure**
	CAUTION: If Unit is in Mode 3 with low pressurizer pressure SI NOT blocked, SI should NOT be manually blocked to prevent safety injection.	

Op Test No.: NRC 2010302 Scenario # 2 Event # 6 Page 24 of 61

Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

Time	Position	Applicant's Actions or Behavior
	RO	4. **MONITOR** RCS pressure STABLE or RISING.

Evaluator Note: If VCT level is above 13%, crew continues; since this is a "**MAINTAIN**" step, crew will return to and take the actions of this step should VCT level go below the prescribed 13%.

Time	Position	Applicant's Actions or Behavior
	RO	5. **MAINTAIN** VCT level greater than 13% **USING** automatic or manual makeup.
		RNO: **IF** leak is on charging header…**N/A**
	RO	**IF** VCT level CANNOT be maintained, **THEN PERFORM** the following:
		a. **ENSURE** CCP suction aligned to RWST:
		1) **OPEN** LCV-62-135 and -136. 2) **CLOSE** LCV-62-132 and 133.
	RO	Determines 13% cannot be maintained and: Manually opens LCV-62-135 and -136; Manually closes LCV-62-132 and 133.
	SRO	b. **IF** in MODE 1 or 2, **THEN TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection. **Directs operator to trip the reactor and enters E-0**

Evaluator Note: SRO assigns BOP to perform appendices (attached at the end of this event guide) as appropriate.

Time	Position	Applicant's Actions or Behavior
	NOTE 1:	Appendix I or J may be used to estimate RCS leak rate.
	NOTE 2:	If letdown was isolated in Step 2, the leak rate may have exceeded capacity of one CCP in the normal charging alignment (EAL 1.2.2P).
		6. **EVALUATE** EPIP-1, Emergency Plan Classification Matrix.
	SRO	7. **EVALUATE** Tech Spec/TRM LCOs **USING** Appendix K, Evaluating Tech Specs and TRM (attached at the end of this event guide).
	BOP	8. **CHECK** secondary side radiation NORMAL…
	Crew	9. **STOP** containment purging and venting:

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

Time	Position	Applicant's Actions or Behavior
	BOP	10. **CHECK** containment airborne activity RISING. (RM-90-106 or 112)
Evaluator Note:		Crew should have identified leak source in Step 2 when Letdown was isolated; Step 11 RNO transitions the crew to step 23 or allows using selected step(s) from steps 12-22 to isolate thee identified leakage source; in this case step 13.
	Crew	11. **CHECK** leakage source UNKNOWN. ***(RNO required)***
		RNO: **IF** leakage source is KNOWN, **THEN PERFORM** the following:
		a. **REFER TO** applicable action in Steps 12 through 22.
		b. **IF** leakage source can be isolated, **THEN ENSURE** leak ISOLATED.
		c. **GO TO** Step 23.
	RO	12. **CHECK** pressurizer PORVs NORMAL:
	RO/ Crew	13. **ISOLATE** letdown… **Crew should have identified leak source as Letdown when it is isolated.**
	RO	a. **ENSURE** the following letdown orifice valves CLOSED:
		• FCV-62-72 • FCV-62-73 • FCV-62-74
	RO	b. **ENSURE** the following letdown isolation valves CLOSED:
		• FCV-62-69 • FCV-62-70 • FCV-62-77
	RO	c. **CHECK** leak ISOLATED based upon the following:
		• containment parameters
	BOP	• estimated leak rate **USING** Appendix I or J.

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Event Description:	CVCS Leak in Aux Building (on Letdown line; ~90 gpm)						

Time	Position	Applicant's Actions or Behavior
	RO	d. **ENSURE** the following charging header isolation valves CLOSED:
		• FCV-62-90 • FCV-62-91
	SRO	e. **GO TO** Step 23.
	BOP	23. **MONITOR** auxiliary building radiation and HELB recorders NORMAL.
	BOP	24. **CHECK** leak IDENTIFIED and ISOLATED **USING** available methods **Leak identified and isolated; leak rate determination being tracked from previous Appendices implementation.**
	SRO/ Crew	25. **MONITOR** if charging and letdown should be restored:
	SRO	a. **CHECK** letdown ISOLATED. ***(RNO required)***
		b. **CHECK** pzr level:
		• level greater than or equal to program level
		• level RISING.
		c. **CHECK** charging and normal letdown AVAILABLE:
		• piping INTACT
		• valves OPERABLE
		• Train A CCS in service. ***(RNO required)***
	SRO	**RNO:** c. **IF** Train A CCS is in service, **THEN EVALUATE** placing excess letdown in service **USING** EA-62-3, Establishing Excess Letdown. **GO TO** Step 26.

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

Time	Position	Applicant's Actions or Behavior
		26. **MONITOR** if pressurizer heaters should be restored:
		a. **CHECK** pressurizer level greater than 20% and rising.
		b. **ENSURE** pressurizer heaters in service as required.
		27. **IF** containment purging or venting is needed…**N/A**
		28. **INITIATE** leak repairs.
		29. **GO TO** appropriate plant procedure.
		END OF SECTION

Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.

		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 leak is isolated (Step 13).

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

SQN	RCS LEAK AND LEAK SOURCE IDENTIFICATION	AOP-R.05 Rev. 14

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APPENDIX I

ESTIMATING RCS LEAK RATE USING CVCS FLOW BALANCE

NOTE 1 This method is recommended when leak requires rise in charging flow greater than ~10 gpm. Appendix J is more accurate for smaller leak rates.

NOTE 2 This appendix assumes RCS temperature and charging flow are approximately constant.

	INITIAL	FINAL	CHANGE
PZR Level			[1] (negative for level decrease)
Time			[2]
Charging Flow	[3]		
Letdown Flow	[4]		
Total RCP Seal Return Flow	[5]		

Pressurizer Level Conversion

Pressurizer level change		conversion factor		Time Change		Pzr Level Rate of Change (positive for level rising)
%	X	62 gal / %	÷	min	=	gpm
step [1] above				step [2] above		[6]

Leak Rate Calculation

Charging Flow		Letdown Flow		Seal Return Flow		Pzr Level Rate of Change		Instrument error correction factor		RCS Leak Rate
	–		–		–		+	3 gpm	=	gpm
step [3] above		step [4] above		step [5] above		step [6] above				

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

SQN	**RCS LEAK AND LEAK SOURCE IDENTIFICATION**	**AOP-R.05** **Rev. 14**

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APPENDIX J

ESTIMATING RCS LEAK RATE USING VCT AND PZR LEVEL

CAUTION This appendix CANNOT be used during VCT makeup, boration, or dilution.

NOTE This appendix assumes RCS temperature is approximately constant.

	VCT LEVEL (%)	PZR LEVEL (%)	TIME (min)
INITIAL			
FINAL			
CHANGE	[1] (positive for level decrease)	[2] (positive for level decrease)	[3]

VCT Level Conversion

VCT level change		conversion factor		Time Change		VCT Level Rate of Change (positive for level lowering)
%	X	20 gal / %	÷	min	=	gpm
step [1] above				step [3] above		[4]

Pressurizer Level Conversion

Pressurizer level change		conversion factor		Time Change		Pzr Level Rate of Change (positive for level lowering)
%	X	62 gal / %	÷	min	=	gpm
step [2] above				step [3] above		[5]

Leak Rate Calculation

VCT Level Rate of Change		Pzr Level Rate of Change		RCS Leak Rate
	+		=	gpm
step [4] above		step [5] above		

Op Test No.:	NRC 2010302	Scenario #	2	Event #	6	Page	30 of 61
Event Description:	CVCS Leak in Aux Building (on Letdown line; ~90 gpm)						

SQN	**RCS LEAK AND LEAK SOURCE IDENTIFICATION**	**AOP-R.05** **Rev. 14**

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APPENDIX K
EVALUATING TECH SPECS AND TRM

1. EVALUATE the following Tech Spec/TRM LCOs for applicability:

3.2.5, DNB parameters – may be applicable depending on Letdown isolation:
3.2.5.b. Pressurizer Pressure would be applicable ACTION: w/ any of the above parameters exceeding its limit, restore w/i its limit w/i 2 hrs or reduce THERMAL POWER <5% of RTP w/i next 4 hrs.

- 3.4.3.1, Safety and Relief Valves-Operating – **N/A**
- 3.4.3.2, Relief Valves-Operating– **N/A**

3.4.6.2.a, RCS Leakage – PRESSURE BOUNDARY LEAKAGE: – **N/A**

- 3.4.6.3, RCS Pressure Isolation Valve Leakage – **N/A**
- TRM 3.4.11, Reactor Coolant System Head Vents – **N/A**
- 3.4.12, Low Temperature Overpressure Protection Systems – **N/A**
- 3.6.1.4, Containment Pressure – **N/A**
- 3.6.1.5, Containment Air Temperature – **N/A**

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

EA-62-3, Establishing Excess Letdown		
Time	**Position**	**Applicant's Actions or Behavior**
		4.0 OPERATOR ACTIONS
		4.1 Placing Excess Letdown in Service
	NOTE:	If seal return valves FCV-62-61 or FCV-62-63 are closed, excess letdown flow will be routed to PRT via relief valve 62-636. Reopening FCV-62-61 and FCV-62-63 following a Phase A Isolation is addressed in applicable EOP steps.
		1. **IF** excess letdown is only letdown flowpath, T**HEN CONTROL** charging flow as necessary to prevent high pressurizer level.
		2. **IF** high activity levels in RCS are suspected, **THEN NOTIFY** Radiological Control (Radcon) section to monitor plant radiological conditions as required.
		3. **ENSURE** CCS inlet to excess letdown heat exchanger **[FCV-70-143]** OPEN.
		4. **ENSURE** CCS outlet to excess letdown heat exchanger **[FCV-70-85]** OPEN.
		5. **VERIFY** CCS flow to excess letdown heat exchanger greater than 230 gpm, as indicated on.**[FI-70-84]**.
		6. **ENSURE** excess letdown divert valve **[FCV-62-59]** in NORMAL.
		7. **OPEN** excess letdown isolation valve **[FCV-62-54]**.
		8. **OPEN** excess letdown isolation valve **[FCV-62-55]**.
	NOTE:	**UNIT 1 ONLY** 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.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	6	Page	32	of 61

Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

EA-62-3, Establishing Excess Letdown

Time	Position	Applicant's Actions or Behavior
		9. **ADJUST** excess letdown flow control valve **[FCV-62-56]** as necessary to control flow WHILE maintaining heat exchanger outlet temperature less than 200°F (240°F on Unit 1), as indicated on **[TI-62-58]**.
		10. **NOTIFY** RADCON excess letdown has been placed in service.
		11. **RETURN TO** procedure and step in effect.
		END OF SECTION

Lead Examiner may cue the next event when Tech Specs have been identified, Excess Letdown in service and the crew has stabilized Pzr Level.

Op Test No.: NRC 2010302 Scenario # 2 Event # 6 Page 33 of 61

Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

1-SO-62-6, Excess Letdown

Time	Position	Applicant's Actions or Behavior
	ARP 1-AR-M6-C B-4, FS-62-82 LOW PRESS LTDN FLOW HIGH PRESSURE HIGH step 7.b.: Place Excess Letdown in service in accordance with 1-SO-62-6, Excess Letdown	
		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.	
		[1] **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.
		[2] **NOTIFY** RADCON that Excess Letdown is being placed in service
		[3] **ENSURE [1-FCV-70-143]** CCS water to the excess letdown heat exchanger is **OPEN**.
		[4] **ENSURE [1-FCV-70-85]** Excess Letdown
	NOTE: Step **[5]** will prevent subjecting the CVCS piping downstream of the Excess Letdown HX to a temperature above the design value.	
		[5] **ENSURE [1-FI-70-84]** is indicating greater than 230 gpm.
		[6] **PLACE [1-FCV-62-59]** Excess Letdown 3-way Divert Valve in **DIVERT**.

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

<table>
<tr><th colspan="3">1-SO-62-6, Excess Letdown</th></tr>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td colspan="2">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.</td></tr>
<tr><td></td><td colspan="2">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.</td></tr>
<tr><td></td><td></td><td>[7] IF less than 100 psig in RCS and [1-FCV-62-63] is CLOSED and excess letdown will be aligned for NORMAL operation, THEN</td></tr>
<tr><td></td><td></td><td>[a] ENSURE the following are CLOSED:</td></tr>
<tr><td></td><td></td><td><table>
<tr><th>VALVE ID</th><th>FUNCTION</th><th>INITIALS</th></tr>
<tr><td>1-FCV-62-53</td><td>RCP's Seal Bypass</td><td>_______</td></tr>
<tr><td>1-FCV-62-9</td><td>No. 1 Seal Return</td><td>_______</td></tr>
<tr><td>1-FCV-62-22</td><td>No. 2 Seal Return</td><td>_______</td></tr>
<tr><td>1-FCV-62-35</td><td>No. 3 Seal Return</td><td>_______</td></tr>
<tr><td>1-FCV-62-48</td><td>No. 4 Seal Return</td><td>_______</td></tr>
</table></td></tr>
<tr><td></td><td></td><td>[b] ENSURE [1-FCV-62-63] is OPEN.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[8] OPEN [1-FCV-62-54] Cold Leg Loop #3 Excess Letdown isolation valve.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[9] OPEN [1-FCV-62-55] Excess Letdown containment isolation valve.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[10] OPEN [1-FCV-62-56] slowly to flush piping to RCDT.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[11] WHEN approximately 50 gallons have flushed, THEN CLOSE [1-FCV-62-56], Excess Letdown Flow Control Valve.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

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Event Description: CVCS Leak in Aux Building (on Letdown line; ~90 gpm)

1-SO-62-6, Excess Letdown

Time	Position	Applicant's Actions or Behavior
		[12] **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.
		[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.
		[14] **NOTIFY** RADCON that Excess Letdown has been placed in service.
		END OF TEXT

Lead Examiner may cue the next event when Tech Specs are identified, Excess Letdown in service and Pzr Level stabilized.

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Event Description:	#2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure						

Time	Position	Applicant's Actions or Behavior

Simulator Operator: When directed, initiate Event 6, 7

Indications/Alarms

1-M-4

Indicators:

- **1-FI-1-3A, 3B, SG-1 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-FI-1-10A, 10B, SG-2 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-FI-1-21A, 21B, SG-3 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-FI-1-28A, 28B, SG-4 STEAM FLOW CH-1 & 2: Increasing steam flow**
- **1-XI-92-5005C, RX POWER CH-I N-41: Increasing reactor power**
- **1-XI-92-5006C, RX POWER CH-II N-42: Increasing reactor power**
- **1-XI-92-5007C, RX POWER CH-III N-43: Increasing reactor power**
- **1-XI-92-5008C, RX POWER CH-IV N-44: Increasing reactor power**
- **1-XR-92-5001, NUCLEAR POWER NR-45: Increasing trends on power ranges selected.**

1-M-5

Annunicators:

- **1-XA-M5A A-6, "TS-68-2M/N RC LOOPS T AVG /AUCT T AVG DEVN HIGH-LOW"**
- **C-6, "TS-68-2P/Q REAC COOL LOOPS T REF T AUCT HIGH-LOW**

Indicators:

- **1-TI-68-2E, 25E, 44E, 67E LOOPs 1-4 TAVG Decreasing temperature indications (w/ no rod motion)**
- **1-TR-68-2B, RCS/TURBINE TEMP Recorder trending away from programmed value**

1-M-6

Annunicators:

- **1-AR-M6B A-7, "FS-3-35B STM GEN LOOP 1 STEAMFEEDWATER FLOW MISMATCH"**
- **1-AR-M6B B-7, "FS-3-48B STM GEN LOOP 2 STEAMFEEDWATER FLOW MISMATCH"**
- **1-AR-M6B C-7, "FS-3-90B STM GEN LOOP 3 STEAMFEEDWATER FLOW MISMATCH"**
- **1-AR-M6B D-7, "FS-3-103B STM GEN LOOP 4 STEAMFEEDWATER FLOW MISMATCH**

Indicators:

- **1-PDI-30-42, 43, 44, 45, CNTMT PRESSURE WIDE RANGE Indicators trending up (1.5 psi-SI Actuation)**

Significant Resultant Alarms/Indications:

- **Annunciator 1-XA-55-6A Window E-1: TS-68-2J REACTOR COOLANT LOOPS LO LO TAVG**

T = 70	CREW	Refer to alarm response procedures and carries out the following actions:

Evaluator Note: If alarm 1-AR-M6-A E-2, TS-68-2J REACTOR COOLANT LOOPS LO LO TAVG actuates indicating an excessive cooldown, the crew may decide to manually trip the reactor.

Evaluator Note: Personnel safety is not a concern since this steam break is inside the containment; the crew should monitor for worsening conditions but no personnel safety-based actions are required at this time.

	SRO	May choose to enter AOP-S.05, Steam Or Feedwater Leak. However, safety

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		injection actuation conditions based on either containment pressure or steamline pressure should cause the crew to manually trip the reactor and initiate SI shortly after the event is initiated
		AOP-S.05, Steam Or Feedwater Leak
		1. **MONITOR** personnel safety:
		a. **IF** steam or feedwater lines need to be immediately isolated to protect personnel, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **IF** leak is on steam lines **OR** source is unknown, **THEN CLOSE** MSIVs.
		3) **IF** leak is on feedwater lines **OR** source is unknown, **THEN PERFORM** the following:
		a) **TRIP** MFW pumps.
		b) **CLOSE** Feed Reg Valves.
		4) **GO TO** E-0, Reactor Trip or Safety Injection.
		2. **MONITOR** steam generator levels STABLE on program.
		3. **CHECK** the following:
		• S/G atmospheric relief valves CLOSED
		• steam dumps CLOSED.
		4. **CHECK** main turbine on line.

Evaluator Note: Since Step 5 is a **"MONITOR"** step, the crew may continue in the procedure while developing a reactor vs. turbine power trend (**RNO** second bullet). If so, steps 6 or 7 should be the decision point and therefore transition to reactor trip and E-0 implementation. If an excessive delta between reactor and secondary power develops, the crew may decide to trip the reactor and transition to E-0 here.

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Event Description:	#2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure							

Time	Position	Applicant's Actions or Behavior
	RO	5. **MONITOR** the following:
		• reactor power STABLE ***(RNO required)***
		• reactor power less than or equal to 100% (3455 MWt).
	BOP	**RNO:** **REDUCE** turbine load as necessary…**N/A**
		IF any of the following conditions exist:
	Crew	• greater than 35 MWe load drop is required to maintain reactor power less than or equal to 100% **OR**
	Crew	• steam leak results in reactor power rising by 3% or more **OR**
	Crew	• reactor power CANNOT be controlled by turbine load reduction
		THEN PERFORM the following:
	RO	a. **TRIP** the reactor.
	BOP	b. **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.
	SRO	c. **GO TO** E-0, Reactor Trip or Safety Injection.
Evaluator Note:	Since Step 6 is a **"MONITOR"** step, the crew may continue in the procedure while developing a T-ave vs. T-ref trend. The 3° delta between actual RCS temperature, T-ave, and programmed reference temperature, T-ref is the range the system is capable of restoring following a normal load change. 5° delta is based on the maximum load transient for the RCS. Step 6 insures that RCS temperature is controlled within these normal ranges; if the crew cannot control these limits, they should decide to trip the reactor and transition to E-0.	
	RO	6. **MONITOR** T-avg within 3°F of T-ref. ***(RNO required)***
	SRO/ BOP	**RNO:** **REDUCE** turbine load as necessary to maintain T-avg within 3°F of T-ref (or program value).
	SRO	**IF** T-avg CANNOT be maintained within 5°F of T-ref (or program value),

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		THEN PERFORM the following:
	RO	a. **TRIP** the reactor
	BOP	b. **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.
	Crew	c. **GO TO** E-0, Reactor Trip or Safety Injection.
	SRO	IF a reactor trip is directed, THEN GO TO E-0, *Reactor Trip or Safety Injection.*
	SRO	Direct Manual Rx Trip
	SRO	Enter and Direct E-0 Immediate Operator Actions (IOAs)

Evaluator Note: Since Step 7 is a **"MONITOR"** step, the crew may continue in the procedure while developing a containment pressure trend. SI actuation is at 1.5 psig containment pressure. The SRO should set a trigger value, which is variable depending on the rate of pressure rise. If attained, the crew should decide to trip the reactor and transition to E-0.

Time	Position	Applicant's Actions or Behavior
	NOTE: Tech Spec LCO 3.6.1.4 is applicable if containment pressure exceeds 0.3 psig.	
	RO	7. **MONITOR** containment pressure STABLE
	RO	**RNO:** **IF** containment pressure is approaching 1.5 psig, **THEN PERFORM** the following:
		a. **TRIP** the reactor.
		b. **WHEN** reactor is tripped, **THEN PERFORM** the following:
		1) **INITIATE** Safety Injection. **2)** **CLOSE** MSIVs.
		c. **GO TO** E-0, Reactor Trip or Safety Injection.
	SRO	IF a reactor trip is directed, THEN GO TO E-0, *Reactor Trip or Safety Injection.*
	SRO	Direct Manual Rx Trip
	SRO	Enter and Direct E-0 Immediate Operator Actions (IOAs)

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
Evaluator Note: When the crew enters ES-0.1, Reactor Trip Response, insert Event 7.		
Evaluator Note: Following IOA performance, prior to Steps 1-4 immediate action verification, RO/BOP surveys MCBs for any expected automatic system response that failed to occur. Upon discovery, they may take manual action(s) to align plant systems as expected for the event in progress. [Ref. EPM-4, Prudent Operator Actions (POAs)]		
E-0, *Reactor Trip or Safety Injection*		
Annunicators/Indications as specified at Event 6 initiation		
	Note 1 Steps 1 through 4 are immediate action steps	
	Note 2 This procedure has a foldout page	
	RO	1. VERIFY reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
	BOP	2. VERIFY turbine TRIPPED: • Turbine stop valves CLOSED.
	BOP	3. VERIFY at least one train of shutdown boards ENERGIZED. • Attempt to restore power to at least ONE train of shutdown boards • Place DG 1A-A control switch in START • Verify Train A Shutdown Boards ENERGIZED
	RO	4. DETERMINE if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated) ***(RNO Required)***
	RO/BOP	**RNO:** DETERMINE if SI required: a. IF any of the following conditions exists:

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		• S/G pressure less than 600 psig, OR • RCS pressure less than 1870 psig, OR • Containment pressure greater than 1.5 psig, THEN ACTUATE SI.
	CREW	**Determines SI Actuation not required; transitions to ES-0.1, Reactor Trip Response**
		RNO: b. **IF** SI is NOT required, **THEN PERFORM** the following: 1) **MONITOR** status trees. 2) **GO TO** ES-0.1, Reactor Trip Response
		ES-0.1, Reactor Trip Response
	NOTE: This procedure has a foldout page.	
		1. **MONITOR** SI NOT actuated:
		• SI ACTUATED permissive DARK [M-4A, D4]
		2. **VERIFY** generator breakers OPEN.
Evaluator Note:	Since Step 3 is a **"MONITOR"** step, the crew may continue in the procedure while developing a temperature trend. SI actuation is at 1.5 psig containment pressure. The SRO should set a trigger value for MSIV closure/SI Actuation depending on the rate RCS cooldown is affecting RCS pressure and the containment pressure rise. If attained, the crew should decide to trip the reactor and return to E-0 step 1.	
	RO	3. **MONITOR** RCS temperatures: ***(RNO Required)***
		• **IF** any RCP running, **THEN** **CHECK** T-avg stable at or trending to between 547°F and 552°F.
		OR

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		• **IF** RCPs stopped, **THEN** **CHECK** T-cold stable at or trending to between 547°F and 552°F.
	BOP	**RNO:** **IF** temperature less than 547°F and dropping, **THEN PERFORM** the following:
		a. **ENSURE** steam dumps and atmospheric reliefs CLOSED.
		b. **ENSURE** S/G blowdown isolation valves CLOSED
		c. **IF** cooldown continues, **THEN PERFORM** the following:
		1) **CONTROL** total feed flow **USING** EA-3-8, Manual Control of AFW Flow.
		2) **MAINTAIN** total feed flow greater than 440 gpm UNTIL narrow range level greater than 10% in at least one S/G.
		3) **DEPRESS** RESET on MSR control panel.
		4) **IF** any MSR temp control valve fails to close, **THEN** **ISOLATE** HP steam to MSRs.
		d. **IF** cooldown still continues, **THEN CLOSE** MSIVs and bypass valves
		IF temperature greater than 552°F… **N/A**
	BOP	4. **CHECK** feedwater status:
		a. T-avg less than 550°F.
		b. MFW pumps TRIPPED.
		c. MFW regulating valves CLOSED.
		d. MFW regulating bypass valve controller outputs ZERO.
		e. MFW isolation valves CLOSED.
	BOP	5. **CHECK** total feed flow to S/Gs greater than 440 gpm.

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
	RO	6. **CHECK** if emergency boration is required:
		a. **VERIFY** all control rods fully inserted:
		• Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
		b. **MONITOR** RCS temperature:
		• T-avg greater than 540°F if any RCP running OR • T-cold greater than 540°F if all RCPs stopped.
	CREW	7. **ANNOUNCE** reactor trip **USING** PA system.
	RO	8. **MONITOR** pressurizer level control:
		a. **CHECK** pressurizer level greater than 17%.
		b. **CHECK** non-essential control air established to containment:
		• Unit 1 Only: 1-FCV-32-110 OPEN. [Pnl 6K] • Unit 2 Only: 2-FCV-32-111 OPEN. [Pnl 6L]
		c. **VERIFY** charging IN SERVICE
		d. **VERIFY** letdown IN SERVICE.
		e. **CHECK** pressurizer level trending to 25% (normal range 20% to 30%).

Evaluator Note: Steps 3, 6 & 9 are all **"MONITOR"** steps, the crew may continue in the procedure while developing RCS temperature and/or Pzr level trends as well as monitoring containment pressure. Since SI actuation is at 1.5 psig containment pressure, the following step **RNO** could be the ES-0.1 exit point. However, the SRO may have previously set a trigger value for MSIV closure/SI Actuation depending on the rate RCS cooldown/RCS pressure and the containment pressure rise. If attained, the crew may have previously tripped the reactor based on Prudent Operator Actions (POAs) and rules of usage from EPM-4, User's Guide and returned to E-0 step 1.

	RO	9. **MONITOR** pressurizer pressure control:
		a. Pressurizer pressure greater than 1870 psig ***(RNO Required)***
	SRO	**RNO:** a. **ENSURE** SI ACTUATED. **GO TO** E-0, Reactor Trip or Safety Injection.

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
	SRO	**E-0, *Reactor Trip or Safety Injection*** *(Re-entry from ES-0.1 Reactor Trip Recovery)*
Evaluator Note:		SRO should direct/verify **FOLDOUT PAGE <u>EVENT DIAGNOSTICS</u>** for SG depressurization during performance of the POAs Correct POAs implemented would then result in ALL MSIVs closed, SI actuation and implementation of Appendix E, Isolating AFW to Faulted S/G. Complete isolation is in E-2 Steps 1-4 inclusive. (Appendix E is attached following this event guide.)
		(E-0) **FOLDOUT PAGE**
Evaluator Note:		2.8 psig containment pressure is ϕB and Containment Spray (CSS) actuation setpoint. After verifying CSS actuation & flow, operators should immediately stop RCPs.
Evaluator Note:		1-FCV-72-2A, 1B CNTMT SPRAY HDR ISOL fails to open automatically. RO/BOP opens 1-FCV-72-2A, 1B CNTMT SPRAY HDR ISOL on CSS actuation and verifies CSS actuation & flow. Following this, RO/BOP should immediately stop RCPs.
CRITICAL TASK #2:		Manually actuate at least the minimum complement of containment cooling equipment before an extreme (red-path @ 12.0 psig) challenge develops to the containment CSF.
	SRO/ RO	**<u>RCP TRIP CRITERIA</u>** **IF** any of the following conditions occurs: • RCS pressure less than 1250 psig **AND** at least one CCP or SI pump running **OR** • Phase B isolation, **THEN** **STOP** all RCPs.
		<u>EVENT DIAGNOSTICS</u>
		• **IF** any S/G pressure is dropping uncontrolled, **THEN PERFORM** the following:
	RO/BOP	a. **CLOSE** MSIVs and MSIV bypass valves
		b. **IF** any S/G pressure continues to drop uncontrolled, **THEN PERFORM** the following:
	RO	1) **ENSURE** SI actuated.
		2) **IF** at least one S/G is intact (S/G pressure controlled or rising), **THEN ISOLATE** AFW to faulted S/G(s):
		• **CLOSE** AFW level control valves for faulted S/G(s)
		• **IF** any AFW valve for faulted S/G CANNOT be CLOSED, **THEN PERFORM** Appendix E, Isolating AFW to Faulted S/G.

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		3) **ENSURE** at least one of the following conditions met: **THEN ISOLATE** AFW to faulted S/G(s):
		• total AFW flow greater than 440 gpm **OR**
		• Narrow Range level greater than 10% [25% ADV] in at least one intact S/G.
	SRO	Directs High level step performance/verification Starting with E-0 Step 1:
	RO	1. VERIFY reactor TRIPPED
	RO/BOP	2. VERIFY turbine TRIPPED
	RO/BOP	3. VERIFY at least one train of shutdown boards ENERGIZED
	RO/BOP	4. DETERMINE if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated) ***(RNO Required)***DETERMINE if SI actuated
	RO/BOP	**RNO:** DETERMINE if SI required: b. IF any of the following conditions exists: • S/G pressure less than 600 psig, OR • RCS pressure less than 1870 psig, OR • Containment pressure greater than 1.5 psig, THEN ACTUATE SI.
Evaluator Note:	ES-0.5 steps/actions appear attached to back of event guide. SRO assigns the BOP to perform ES-0.5; therefore, all subsequent MCB actions will be performed by the RO until the BOP completes ES-0.5.	
	BOP	5. PERFORM ES-0.5, Equipment Verifications WHILE continuing in this procedure.
	RO	6. DETERMINE if secondary heat sink available: a. CHECK total AFW flow greater than 440 gpm.

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		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 all S/Gs. (Heat Sink is available from AFW:>440 gpm available.)
	RO	7. 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
	RO	8. 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
	RO	9. MONITOR RCS temperatures: • IF any RCP running, THEN CHECK T-avg stable at or trending between 547°F and °F OR • IF RCPs stopped, THEN CHECK T-cold stable or trending to between 547°F and 552°F
	RO	10. CHECK pressurizer PORVs, safeties, and spray valves: a. Pressurizer PORVs CLOSED. b. Pressurizer safety valves CLOSED. c. Normal spray valves CLOSED.

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Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		d. Power to at least one block valve AVAILABLE. e. At least one block valve OPEN.
	CREW	11. DETERMINE 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 Required)***
	SRO	**RNO:** **PERFORM** the following:
Evaluator Note:		at E-0 to E-2 transition, the crew will implement status tree monitoring via SPDS. When a RED or ORANGE path status tree is observed, the SRO will designate one of the Board operators (typically the BOP) to verify status tree conditions using **1-FR-0, UNIT 1 STATUS TREES**. Once verified, the SRO should direct the crew to transition to the appropriate RED or ORANGE path procedure(s). During E-0→E-2 performance in this scenario, containment pressure will meet entry conditions for FR-Z.1, High Containment Pressure. It follows this event guide.
		a. **MONITOR** status trees.
		b. **GO TO** E-2, Faulted Steam Generator Isolation.
		Crew transitions to E-2, Faulted Steam Generator Isolation.
Crew transitions to E-2, Faulted Steam Generator Isolation.		

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Event Description:	#2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure							

Time	Position	Applicant's Actions or Behavior
E-2, Faulted Steam Generator Isolation		
Evaluator Note: **Critical Task #1:** Isolate the faulted SG before transition out of E-2 (Time Critical Action: AFW isolation) **START TIME:** ___________ **(From E-0 Entry)** **END TIME:** ___________		
	CAUTION: Unisolating a faulted S/G or secondary break should NOT be considered UNLESS needed for RCS cooldown.	
Critical Task	BOP	1. **CHECK** MSIVs and MSIV bypass valves CLOSED.
	BOP	2. **CHECK** ANY S/G secondary pressure boundary INTACT:
		• Any S/G pressure CONTROLLED or RISING
	BOP	3. **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.	
	• If the TD AFW pump is the only source of feed flow, isolating both steam supplies will result in loss of secondary heat sink.	
		4. **ISOLATE** Faulted S/G(s):
	BOP	a. **ENSURE** MFW isolated to faulted S/G(s) by any of the following:
		• feedwater isolation valve CLOSED [M-4]
		OR

Op Test No.:	NRC 2010302	Scenario #	2	Event #	7, 8	Page	49 of 61

Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		E-2, Faulted Steam Generator Isolation
		• feedwater regulating valve and bypass valve CLOSED [M-3].
	BOP	b. **ENSURE** AFW isolated to faulted S/G(s):
		• **CLOSE** MD AFW LCV
		• **CLOSE** TD AFW LCV and **PLACE** in PULL TO LOCK.
	BOP	c. **CHECK** S/G #1 or #4 faulted. ***(RNO required)***
		RNO: c. **GO TO** Substep 4.e.
	BOP	d. **VERIFY** S/G blowdown valves CLOSED.
	BOP	e. **VERIFY** atmospheric relief CLOSED.
	BOP	5. **CHECK** CST level greater than 5%.
	BOP	6. **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.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	7, 8	Page	50 of 61

Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		E-2, Faulted Steam Generator Isolation
	BOP	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.
		e. **WHEN** S/G samples completed, **THEN CLOSE** blowdown isolation valves.
	RO/ SRO	7. **CHECK** SI termination criteria:
		a. RCS subcooling based on core exit T/Cs greater than 40°F.
	BOP	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.
	RO	c. RCS pressure stable or rising.
	RO	d. Pressurizer level greater than 10% [20% ADV].
	SRO	e. **GO TO** ES-1.1, SI Termination.

Op Test No.: NRC 2010302 Scenario # 2 Event # 7, 8 Page 51 of 61

Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
		E-2, Faulted Steam Generator Isolation
	SRO	8. **GO TO** E-1, Loss of Reactor or Secondary Coolant.
		END

Lead Examiner may terminate the scenario at E-2 Step 7.e, SI Termination criteria determination.

Event Description: #2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure

Time	Position	Applicant's Actions or Behavior
FR-Z.1, High Containment Pressure		
	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	1. **MONITOR** RWST level greater than 27%.
	RO	2. **VERIFY** Phase B valves CLOSED:
		• Panel 6K PHASE B GREEN • Panel 6L PHASE B GREEN.
	RO	3. **ENSURE** RCPs STOPPED.
	SRO	4. **DETERMINE** if this procedure should be exited:
	BOP	a. **CHECK** for faulted S/G:
		• Any S/G pressure DROPPING in an uncontrolled manner **OR** • Any S/G pressure less than 140 psig.
	RO	b. **CHECK** containment pressure less than 12 psig.
Evaluator Note:	**Critical Task** is to manually actuate at least the minimum complement of containment cooling equipment before an extreme (red-path, 12 psig) challenge develops to the containment CSF (ES-0.5 Step 13 directs completion by BOP during procedure performance.)	
Critical Task	RO	c. **CHECK at least one containment spray pump RUNNING and delivering flow.**
	BOP	d. **CHECK** at least one containment air return fan RUNNING. ***(RNO required)***
	BOP	**RNO:** d. **WHEN** 10 minutes have elapsed from Phase B actuation, **THEN ENSURE** air return fans RUNNING.
	SRO	e. **RETURN** to procedure and step in effect.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	7, 8	Page	53 of 61
Event Description:	#2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure						

SQN	**REACTOR TRIP OR SAFETY INJECTION**	**E-0** **Rev. 32**

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APPENDIX E

ISOLATING AFW TO FAULTED S/G

1. **IF** motor-driven AFW LCV for faulted S/G CANNOT be closed,
   THEN
   PERFORM the following:

   a. **IF** at least one other AFW pump is available,
   THEN
   PLACE affected MD AFW pump in PULL TO LOCK. ☐

   b. **ENSURE** at least one of the following:

   - total AFW flow greater than 440 gpm ☐

     OR

   - narrow range level greater than 10% [25% ADV] in at least one intact S/G. ☐

   c. **DISPATCH** personnel to locally isolate MD AFW to faulted S/G **USING** EA-3-11, Local Isolation of MD and TD AFW. ☐

   d. **WHEN** MD AFW flowpath to faulted S/G is locally isolated,
   THEN
   ENSURE affected MD AFW pump RUNNING. ☐

Op Test No.:	NRC 2010302	Scenario #	2	Event #	7, 8	Page	54 of 61
Event Description:	#2 Main Steam Line Break Inside Containment w/ 1A Cntmt Spray Pump Sheared Shaft & Cntmnt Spray Pump 1B-B Disch Vlv Auto Open Failure						

SQN	REACTOR TRIP OR SAFETY INJECTION	E-0 Rev. 32

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APPENDIX E

ISOLATING AFW TO FAULTED S/G

NOTE TDAFW pump steam supply will automatically swap from S/G #1 to S/G #4 after 60 second time delay when FCV-1-17 or -18 is closed.

2. **IF** turbine-driven AFW LCV for faulted S/G CANNOT be closed,
THEN
PERFORM the following:

   a. **IF** at least one MD AFW pump is available to supply an intact S/G,
   THEN
   CLOSE FCV-1-17 or FCV-1-18 to stop TD AFW flow. ☐

   b. **ENSURE** at least one of the following:

   - total AFW flow greater than 440 gpm ☐

   OR

   - narrow range level greater than 10% [25% ADV] in at least one intact S/G. ☐

   c. **DISPATCH** personnel to locally isolate TD AFW to faulted S/G **USING** EA-3-11, Local Isolation of MD and TD AFW. ☐

   d. **WHEN** TD AFW flowpath to faulted S/G is locally isolated,
   THEN
   PERFORM the following:

      1) **IF** S/G #1 or 4 is faulted,
      THEN
      ENSURE steam supply from faulted S/G isolated by closing FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4). ☐

      2) **ENSURE** FCV-1-17 and FCV-1-18 OPEN. ☐

      3) **ENSURE** TD AFW pump RUNNING. ☐

END OF TEXT

Op Test No.: NRC 2010302 Scenario # 2 Event # ES-0.5 Page 55 of 61

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken) to SRO.
	BOP	1. **VERIFY** D/Gs RUNNING.
	BOP	2. **VERIFY** D/G ERCW supply valves OPEN.
	BOP	3. **VERIFY** at least four ERCW pumps RUNNING
	BOP	4. **VERIFY** CCS pumps RUNNING
		• Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	5. **VERIFY** EGTS fans RUNNING.
	BOP	6. **VERIFY** generator breakers OPEN.
	Crew	7. **NOTIFY** at least two AUOs to report to MCR to be available for local actions.
	BOP	8. **VERIFY** AFW pumps RUNNING: a. MD AFW pumps b. TD AFW pump.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	ES-0.5	Page	56	of 61
Event Description:	Equipment verifications							

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
	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	9. 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	10. **VERIFY** MFW Isolation: a. MFW pumps TRIPPED b. **ENSURE** the following: • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	11. **MONITOR** ECCS operation:
		a. **VERIFY** ECCS pumps RUNNING: • CCPs: • RHR pumps • SI pumps
		b. **VERIFY** CCP flow through CCPIT.
		c. **CHECK** RCS pressure less than 1500 psig.
		d. **VERIFY** SI pump flow.
		e. **CHECK** RCS pressure less than 300 psig.
		f. **VERIFY** RHR pump flow.
	BOP	12. **VERIFY** ESF systems ALIGNED:
		a. Phase A ACTUATED: • PHASE A TRAIN A alarm LIT [M-6C, B5]. • PHASE A TRAIN B alarm LIT [M-6C, B6].

Op Test No.: NRC 2010302 Scenario # 2 Event # ES-0.5 Page 57 of 61

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
ES-0.5, EQUIPMENT VERIFICATIONS		
		b. Cntmt Vent Isolation ACTUATED: • CNTMT VENT ISOLATION TRAIN A alarm LIT [M-6C, C5]. • CNTMT VENT ISOLATION TRAIN B alarm LIT [M-6C, C6].
		c. Status monitor panels: • 6C DARK • 6D DARK • 6E LIT OUTSIDE outlined area • 6H DARK • 6J LIT.
		d. Train A status panel 6K: • CNTMT VENT GREEN • PHASE A GREEN
		e. Train B status panel 6L: • CNTMT VENT GREEN • PHASE A GREEN
Evaluator Note: **Critical Task** is to manually actuate at least the minimum complement of containment cooling equipment before an extreme (red-path) challenge develops to the containment CSF (ES-0.5 Step 13 directs completion by BOP during procedure performance)		
	BOP	13. **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

Op Test No.:	NRC 2010302	Scenario #	2	Event #	ES-0.5	Page	58 of 61
Event Description:	Equipment verifications						

Time	Position	Applicant's Actions or Behavior
ES-0.5, EQUIPMENT VERIFICATIONS		
		b. **VERIFY** containment spray INITIATED:
Critical Task:	1-FCV-72-2, 1B Containment Spray Pump Discharge Valve, fails to open; RO/BOP manually opens 1-FCV-72-2	
Critical Task		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].
		d. **ENSURE** RCPs STOPPED.
		e. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN. • Panel 6L PHASE B GREEN.
		f. **WHEN** 10 minutes have elapsed, **THEN ENSURE** containment air return fans RUNNING.
		14. **MONITOR** if containment vacuum relief isolation valves should be closed:
		a. **CHECK** containment pressure greater than 1.5 psig.
		b. **CHECK** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48.

Op Test No.:	NRC 2010302	Scenario #	2	Event #	ES-0.5	Page	59	of 61
Event Description:	Equipment verifications							

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
	BOP	15. **CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors (attached) • Appendix B, Containment Rad Monitors. (attached)
	BOP	16. **WHEN** directed by E-0, **THEN PERFORM** Appendix D, Hydrogen Mitigation Actions.
		17. **CHECK** 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	18. **DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	19. **ENSURE** plant announcement has been made regarding Reactor Trip and SI.

Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken, i.e.: containment Spray operating discrepancies per ES-0.5 Step 13) to SRO.

END (ES-0.5, EQUIPMENT VERIFICATIONS)

Op Test No.: NRC 2010302 Scenario # 2 Event # ES-0.5 Page 60 of 61

Event Description: Equipment verifications

(ES-0.5, EQUIPMENT VERIFICATIONS)		
APPENDIX A SECONDARY RAD MONITORS		
	BOP	1. **CHECK** following rad monitors including available trends prior to isolation: • Condenser exhaust recorder RR-90-119 • S/G blowdown recorder RR-90-120 • Main steam line rad monitors • Post-Accident Main Steam Line rad recorder RR-90-268B points 3 (blue), 4 (violet), 5 (black), and 6 (brown). [M-31 (back of M-30)]
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.
END OF TEXT		

APPENDIX B CONTAINMENT RAD MONITORS		
	BOP	1. **CHECK** following rad monitors: • Upper containment high range rad monitors RM-90-271 and RM-90-272 NORMAL [M-30] • Lower containment high range rad monitors RM-90-273 and RM-90-274 NORMAL [M-30] • Containment rad recorders RR-90-112 and RR-90-106 NORMAL [M-12] (prior to isolation).
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.
END OF TEXT		

Op Test No.:	NRC 2010302	Scenario #	2	Event #	Critical Tasks	Page	61 of 61
Event Description:	Critical Task Listing						

Critical Tasks:	Critical Task Statement	Action Location	ESG pg #
1.	Isolate the faulted SG before transition out of E-2	E-2 Steps 1-4	48
2.	Manually actuate at least the minimum complement of containment cooling equipment before an extreme (red-path) challenge develops to the containment CSF	E-0 FOLDOUT Page response	44*
		ES-0.5 Step 13	58
		FR-Z.1 Step 4.c	52

* **Procedure and step that operator actions satisfy this Critical Task are expected to be performed; similar actions are directed several times in the expected procedural path for this Critical Task.**

Sequoyah Nuclear Plant

E36-2

Unit 1 & 2

General Operating Instructions

0-GO-5

NORMAL POWER OPERATION

Revision 0065

Quality Related

Level of Use: Continuous Use

Effective Date: 03-12-2010

Responsible Organization: OPS, Operations

Prepared By: W. T. Leary

Approved By: P. R. Simmons

Current Revision Description

Revised to address requirements overlooked in the initial issuance of the guidance for compliance with NERC Reliability Standards, VAR-002. These changes make no alteration to the operation of any equipment and are changes to required administrative notifications only. These changes are therefore minor editorial changes as defined in SPP-2.2.

PERFORMANCE OF THIS PROCEDURE IMPACTS REACTIVITY.

Table of Contents

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

This General Operating (GO) Instruction provides guidance for power ascension from approximately 30 to 100% power, at power conditions, power reduction from 100 to 30% power, Power Coastdown at End of Life operations, and Load Follow operations.

This instruction provides additional guidance for turbine control restoration following a turbine runback.

1.2 Scope

This GO contains the following sections:

5.1 Power Ascension From 30% Power to 100%

5.2 At Power Conditions

5.3 Power Reduction From 100% to 30%

5.4 Power Coastdown at End of Life

5.5 Load Follow Operations

2.0 REFERENCES

2.1 Performance References

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

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

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

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

E. 1,2-SO-2-9, *Condenser Vacuum and Turbine Steam Seal Systems Operation*

F. 0-SO-12-1, *Auxiliary Boiler System*

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

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

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

J. 1,2-SO-62-1, *Chemical and Volume Control System*

K. 0-SO-62-7, *Boron Concentration Control*

L. 1,2-SO-62-9, *CVCS Purification System*

M. 0-SO-68-3, *Pressurizer Spray and Heater Pressure Control System*

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

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

P. 0-SI-OPS-092-078.0, *Power Range Neutron Flux Channel Calibration By Heat Balance Comparison*

Q. 0-SI-CEM-000-050.0, *72-Hour Chemistry Requirements*

R. 0-SI-CEM-030-407.2, *Radioactive Gaseous Waste Effluent Particulate and Iodine Dose Rates from Shield and Auxiliary Building Exhausts (Weekly/Special) and Condenser Vacuum Exhausts (Special)*

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

T. 0-SI-OPS-000-001.0, Initial Startup System Parameter Log

U. TI-40, *Determination of Preconditioned Reactor Power*

2.1 Performance References (continued)

V. 2-SO-98-1, *Distributed Control System*

2.2 Developmental References

A. Memorandum from System Engineering concerning MSR operation - RIMS S57 880322 999

B. Memo from Reactor Engineering - RIMS S57 941219 934

C. S57-880322-999 and S57-880808-851

D. W Letter GP89-076 (RIMS No. S53 890427 984)

E. W Letter GP 89-155 (RIMS S57 891026 972)

F. W Letter GP 86-02(B44 861112 002)

G. SSP-2.3, *Administration of Site Procedures*

H. TVA-NQA-PLN89-A

I. GOI-10, *Reactivity Control at End of Cycle Life* (Trojan Nuclear Plant)

J. FSAR, Section 13.5

K. Memo from Reactor Engineering - August 6, 1996 (G Bair)

L. NERC Reliability Standard, VAR-002-1.1b

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

A. To ensure that NIS Reactor Power level indications remain within 2% of true power during power level changes, a check should be performed about every 20% power level change, when greater than 15% power, by comparing calorimetric power to each NIS Power Range drawer. The 20% power level check does not preclude the operating crews from making necessary changes in response to changing plant conditions.

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 or equal to 250°F.

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

C. The following should be used to determine the most accurate reactor power indication for comparison with NIS:

- When reactor power is greater than 15%, use LEFM calorimetric power indication (U2118).
- If LEFM is NOT available, then use average loop ΔT (UO485 or M-5 indicators) up to 40%. Above 40%, use computer point U1118.

D. 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 Ltr GP 89-155; RIMS S57 891026 972)

E. Pressurizer heaters and sprays may be operated as required to maintain pressurizer and RCS boron concentration within 50 ppm. If loop boron concentration is changed by 20 ppm or greater, use the pressurizer backup heaters to initiate automatic spray (if available). If Normal Spray is NOT available, then use Auxiliary Spray (1, 2-SO-62-1, Section 8.7) in conjunction with pressurizer backup heaters.

3.1 Precautions (continued)

F. Condensate DI polishing operations during power ascension are controlled by staying within system parameters and by recommendations from the Chemistry Section.

G. The valve position limiter should be periodically positioned approximately 10% above the current governor control indications (keeps governor valves off of the limiter) as turbine load is changed. 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.

H. Any off-frequency turbine operation is to be reported to Engineering for record keeping. The report will include duration and magnitude of off-frequency operation.

I. 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.

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

K. Initial Startup After Refueling - 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 at the following RTP hold points. Reactor Engineering and/or Systems Engineering will determine procedure performance. [C.3]

   1. At < 50% RTP a flux map and single point alignment, a hot channel factor determination, an axial imbalance comparison, and a PR NIS calibration will be performed. The PR high range trip setpoint will then be increased to its normal value of 109%.

   2. At < 75% RTP, calorimetric calculations and RCS flow verification may be performed, EAGLE-21 updated prior to increasing power, a flux map, a hot channel factor determination, an axial imbalance comparison may be required if not performed at < 50%, a detector calibration (if Δ AFD $\geq$ 3%), and a PR NIS calibration may be performed.

3.1 Precautions (continued)

3. If not performed at 75% hold point, an axial imbalance comparison and a detector calibration (if Δ AFD ≥ 3%) should be performed at ~ 100% RTP. Engineering will determine if PR NIS calibration must be performed. Calorimetric calculations, RCS flow verification, a hot channel factor determination, and a reactivity balance will be performed and EAGLE-21 updated. Reactor Engineering will notify Operations that normal full power operations may proceed.

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

5. 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.

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

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

    b. 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.

    c. 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.*

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

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

L. Declared fuel defects, as determined by the Fuel Reliability Assessment Team or the Shift Manager, have limited ramp rates during Reactor Power increases as specified in TI-40.

M. TI-40 power increase limits that are exceeded, in any one hour, are evaluated in accordance with SPP-3.1.

3.1 Precautions (continued)

N. Power Coastdown At End Of Life:

1. Reactor power changes should be limited to less than or equal to 1% per hour to avoid causing xenon peaking which could force a plant shutdown.

2. Do not perform unnecessary unit power maneuvers or testing (e.g., turbine valve testing). Such testing could result in an uncontrollable Xenon oscillation.

3. Nonessential work on systems which could cause a plant upset should be deferred.

4. Secondary Plant runbacks such as Main Feed Pump Turbine trip or #3 Heater Drain Tank runback will require a unit shutdown if Reactor power is not promptly returned to pre-transient level due to the resulting severe Xenon transient. If a system power alert is in effect, and electrical generation is critical, unit load should be reduced as necessary keeping T_{AVG} on program. Contact Reactor Engineering for an evaluation and guidance concerning unit shutdown or reduction of load.

5. Management should be consulted to evaluate the feasibility of a unit restart if a reactor trip occurs with RCS equilibrium boron concentration less than 50 ppm. If the reactor is to be restarted, the power level shall be limited to nominal pre-trip power level.

O. Axial Flux Difference Management:
When the reactor is operating at a steady power or during normal load changes, maintain ΔI within the operating limits of the Core Operating Limits Report (COLR). It is recommended that the core axial flux difference (AFD) be maintained within ± 5% of the target band at all times, excluding the performance of 0-PI-NUC-092-036.0, "Incore - Excore Calibration," and End of life power coast downs. Operating time outside the band, which is given in TI-28 Attachments 1 and 2, should be minimized. Reactor Engineering should be contacted if time out of the ± 5% target band exceeds approximately 30 minutes.

P. The position of control 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 5 steps below this guidance for long term, then impact may occur to safety analysis assumptions.

Q. During heatup and cooldown transients, RCS density changes will cause changes in NIS indicated power. At constant reactor power, a 1°F change in T_{AVG} may cause as much as a 1% (or more) change in indicated NIS power.

3.1 Precautions (continued)

R. The following limitations are applicable to Unit Two ONLY. N/A

1. In winter months #7 HDTP capacity is not adequate to pump #6 Heater drains when all Condensate Demineralizer pumps are in service. Current practice is to run two Cond DI Pumps and / or throttle the condensate system to reduce backpressure. The preferred method is to throttle condensate pressure instead of running only two Condensate Demineralizer booster pumps at full power due to pump runout concerns.

2. Siemens-Westinghouse analysis has determined that the maximum unit power with one MFP operation is 65% under worst case conditions. The plant could operate higher if plant conditions permit.

3. MFP flow from the lead MFP should not exceed 53.7% of the total flow. Flow rates above this would result in HP steam flow to the lead MFPT. Computer points 1(2)UO504 and UO505 can be used to monitor.

S. Voltage Control

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Operation of the Main Generator without Automatic Voltage Control could impact grid voltage requirements. Refer to GOI-6 for MVAR limits.

2. When the Main Generator is connected to the grid, the voltage regulator shall be operated in Automatic, unless coordinated with the Transmission Operator (SELD).

3. Main Generator operation outside of the Transmission Voltage Schedule requires coordination with the Transmission Operator, and notation in the operator's Log of time, reason, and that the Transmission Operator notification was made.

4. When directed to modify voltage, the Generator Operator shall comply (within plant procedural requirements) or provide an explanation of why the schedule cannot be met.

5. While the Main Generator is tied to the grid perform the following:

   a. The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between AUTO and Manual as soon as practical but notification shall be within 30 minutes.

3.1 Precautions (continued)

b. The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfers between Manual and Auto.

c. All position changes (to and from Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration and notifications made.

f. Reliability Directives and Protective Relay/Equipment Failures

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Plant Operations shall notify the Transmission Balancing Authority (BA) or Transmission Operator of protective relay or equipment failures that creates a creditable risk to Plant Generation. A creditable risk to generation represents a potential reduction in transmission system reliability.

2. Reliability Directives to the Generator Operator are via the Balancing Authority or Transmission Operator. Required action time may range from immediate to no longer than 30 minutes. Actions shall be taken without delay. The directives may be associated with preventing or clearing Local System issues, or neighboring system issues.

3. Plant operations shall take timely actions as directed by the Balancing Authority or Transmission Operator to mitigate critical conditions to return the bulk electrical system to a reliable state. Plant operations shall comply with Balancing Authority or Transmission Operator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements.

4. Plant Operations shall immediately inform the Balancing Authority or Transmission Operator of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

3.2 Limitations

A. When the axial flux difference monitor alarm is inoperable, the AFD must be logged every hour by performing 0-SI-NUC-000-044.0.

(SR 4.2.1.1.a.2 & 4.2.1.1.b)

B. When both the plant computer and NIS QPTR alarm systems are inoperable, the QPTR must be calculated every 12 hours by performing 0-SI-NUC-000-133.0. (SR 4.2.4.1.b)

C. Do not exceed a load change rate of plus or minus 5% per minute or a step change of 10%.

D. River water temperatures shall be maintained within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0.

> **NOTE**
>
> Westinghouse should be contacted if the turbine is operated outside of its operating limits as stated below.

E. To prevent high vibratory stresses and fatigue damage to the last stage turbine blading, do not operate the turbine 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)

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.

F. Do not allow the generator to become underexcited.

G. 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 0-SI-CEM-000-050.0, 0-SI-CEM-030-407.2 and 0-SI-CEM-000-415.0 due to the thermal power change.

3.2 Limitations (continued)

H. The following Main Turbine vibration limitations and actions should be adhered to:

1. Vibration levels which exceed 7 mils (alarm setpoint) should be verified by Predictive Maintenance Group.

2. Vibration levels greater than 7 mils and less than 14 mils should be continuously monitored by Predictive Maintenance Group.

3. IF vibration level is greater than or equal to 14 mils, THEN TRIP the turbine.

I. Westinghouse recommends that if any throttle valve is held closed for more than 10 minutes, then it should be re-tested immediately upon reopening in accordance with 1,2-PI-OPS-047-002.0.

J. The generator may be operated without a bus duct cooler up to approximately 729 MW turbine load.

K. To ensure sufficient voltage for a safe shutdown after loss of both units, voltage and reactive power should be maintained within the limits of GOI-6.

L. With LEFM calorimetric power indication available, full power operation is defined as approximately 3455 MW_T not to exceed 3455.0 MW_T averaged over a 8-hour period. [C.1] If LEFM is available, power shall be monitored using plant computer point U2118 Instantaneous Value. **DO NOT** allow average thermal power to exceed 3455 MW thermal for two consecutive hours. Every effort should be made to maintain core thermal power 10 minute average less than 3455 MWt.

M. The following restrictions apply if LEFM calorimetric power indication (U2118) is unavailable:

1. Applicable action of TRM 3.3.3.15 must be entered.

2. AFD limits in COLR and TI-28 must be made more restrictive by 1%.

3. Rod insertion limits in COLR must be raised by 3 steps.

4. If reactor power is greater than 40%, power should be monitored using U1118. If U1118 is also unavailable, use the highest reading NIS channel.

5. If reactor power is less than 40%, use the RCS average ΔT as the preferred method for determining power level.

3.2 Limitations (continued)

N. IF equilibrium conditions are achieved, after exceeding by 10% or more of rated thermal power the thermal power at which the heat flux hot channel factor was last determined, THEN conditional performance of 0-SI-NUC-000-126.0, Hot Channel Factor Determination is required.

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. With one LP heater string out of service (isolated), power is limited to 86% (Unit 1) or 90% (Unit 2). This is based on LP turbine blading limitations. (Ref: DCN E21203A).

Q. #3 heater drain tank should remain drained with LCV-6-105A and B failed open (per 1, 2-SO-5-2) until reactor power exceeds ~45-50%. This will prevent intermediate heater string isolations if a turbine trip occurs at lower power levels. If a level is established in the number 3 Heater Drain Tank prior to exceeding P-9 setpoint (50% power), a turbine trip will result in Intermediate Pressure Heater string isolation(s).

STARTUP No. 1 **Unit** 1 **Date** today

4.0 PREREQUISITES

NOTES

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

2) Prerequisites may be completed in any order.

[1] **ENSURE** Instruction to be used is a copy of effective version. RO1

[2] T_{AVG} is being maintained within 1.5°F of T_{REF}. ☑

[3] SG level controls are being maintained in AUTO (**N/A** if auto control **NOT** available). ☑

[4] Control rods are being maintained within the operating band of Core Operating Limits Report (COLR) (**N/A** if shutting down due to dropped or misaligned rod). ☑

[5] Steam dump control system is in the T_{AVG} mode (**N/A** if Tavg Mode **NOT** available). ☑

[6] The EHC system should be in OPER AUTO (pushbutton lit). ☑

[7] Generator pressurized with hydrogen according to capability curve. (TI-28, Fig. A.I4) ☑

[8] PRMs are being maintained within ±2% of core thermal power readings. ☑

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. RO1

STARTUP No. 1 Unit 1 Date today

4.0 PREREQUISITES (continued)

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

Print Name	Initials

STARTUP No. 1 **Unit** 1 **Date** today

5.2 At Power Conditions

CAUTIONS

1) Full power operation is defined as approximately 3455 MWT NOT to exceed 3455.0 MWT averaged over an 8-hour period. [C.1]

2) Power shall NOT exceed one hour average (U2125) of 3455.00 MWT.

3) Power shall NOT exceed an 8-hour average value (U2126) of 3455.00 MWT (readings at 0700, 1500 and 2300 hours).

NOTES

1) Failure to comply with the following NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.

2) The Transmission Operator shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]

3) The Transmission Operator shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.

4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.

5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.

6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made

7) 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 30 minutes.

8) Steps in this section may be performed out of sequence.

[1] **ENSURE** Section 3.0, Precautions and Limitations, have been reviewed. ______

[2] **TREND** Computer point U2118 on a trend recorder in the unit horseshoe and monitor for increasing reactor power trends above 3455 MW_T. ☑

STARTUP No. 1 Unit 1 Date Today

5.2 At Power Conditions (continued)

[3] **IF** increasing power trend is observed, **THEN**

ENSURE PROMPT action is taken to decrease reactor power as necessary. [C.1]

_______ 1st

_______ CV

NOTE

Examples of activities which may cause a rise in Reactor power include, but are not limited to RCS dilution, S/G flow changes, TDAFWP testing, secondary plant activities which impact feed flow or temperature and/or RCS pressure changes.

[4] **IF** any preplanned activity will be performed which is expected to cause a transient increase in thermal power,
THEN
REDUCE turbine load and/or insert negative reactivity (using control rods or boration) prior to starting activity as necessary to ensure 10 minute average power (U2221RA or U1118RA) will not exceed 3455 MWt.

_______ 1st

_______ CV

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

CAUTION

If LEFM is lost with reactor power at 100%, core thermal power should NOT be raised to take advantage of U1118 reading lower.

NOTE

The following restrictions apply if LEFM calorimetric power (U2118) is unavailable:

- Applicable action of TRM 3.3.3.15 must be entered.
- AFD limits in COLR and TI-28 must be made more restrictive by 1%.
- Rod insertion limits in COLR must be raised by 3 steps.

[5] **IF** ICS point U2118 is unreliable or unavailable,
THEN
PERFORM the following:

[5.1] **MONITOR** thermal power by using one of the following:

- ICS point U1118 (if available) ☐
- highest reading NIS power range channel. [C.1] ☐

[5.2] **RESTORE** calorimetric power indication prior to next required performance of 0-SI-OPS-092-078.0. ☐

[5.3] **IF** LEFM CANNOT be restored prior to 0-SI-OPS-092-078.0 being required,
THEN

ENSURE power is less than or equal to 98.7% (3411 MW_T) prior to performing 0-SI-OPS-092-078.0:

- **REDUCE** turbine load as necessary. ☐
- **MAINTAIN** T_{AVG} and AFD on program using boration and/or rod insertion as necessary. ☐

[5.4] **PERFORM** 0-SI-OPS-092-078.0 using U-1118 or alternate method. ☐

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

[5.5] **MAINTAIN** power less than or equal to 98.7% (3411 MWT) UNTIL LEFM is restored and 0-SI-OPS-092-078.0 is re-performed using LEFM data. ☐

[6] **MAINTAIN** rod control system in automatic to allow proper plant response to load reductions and runbacks. ☐

[7] **DURING** steady state operation ≥ 85% RTP **MAINTAIN** control bank D greater than 215 steps if possible and AFD within the nominal ± 5% target band and also within the AFD limits specified in the COLR. ☐

[8] **DURING** steady state operation < 85% RTP **MAINTAIN** control bank D greater than 165 steps if possible and the axial flux difference (AFD) within the nominal ± 5% target band and also within the AFD limits specified in the COLR. ☐

[9] **OPERATE** the turbine in IMP OUT due to inherent system swings during operation in IMP IN. (Operation in IMP IN is permitted during governor valve testing.) ☐

NOTE

Valve position limiter should normally be maintained ~ 2% above governor valve position unless load swings occur.

[10] **IF** unsatisfactory load swings are observed, **THEN**

ADJUST governor valve position limiter as necessary to limit governor valve motion.

_______ 1st _______ CV

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

CAUTION

Do NOT raise the limiter position unless the turbine control is positively controlling the turbine (limit light NOT LIT).

[11] **IF** governor valve motion limiting is no longer needed, **THEN**

[11.1] **ADJUST** SETTER/REFERENCE controls to reduce turbine loading until the VALVE POS LIMIT light is NOT LIT. ☐

[11.2] **INCREASE** VALVE POS LIMITER setpoint to ~ 2% above current load, ENSURING load does NOT change. ☐

[12] **IF** an axial xenon oscillation develops and requires suppression, **THEN**

[12.1] **MOVE** control bank inward when AFD is moving positive above target AFD, **OR**

[12.2] **MOVE** control bank outward when AFD is moving negative below target AFD, **AND**

HOLD AFD at target until oscillation is suppressed. ☐

[12.3] **IF** this basic first overtone control is insufficient, **THEN**

CONTACT Reactor Engineering for assistance. ☐

STARTUP No. 1　　**Unit** 1　　**Date** Today

5.2 At Power Conditions (continued)

> **NOTE**
>
> Lowering load on the Main Generator will cause VARs to trend in the positive direction (toward outgoing). This will require lowering generator voltage. Conversely, raising generator load will cause VARs to trend in the negative direction and will require raising generator voltage. Refer to GOI-6 Section E for MVAR limits for generator stability. Refer to precautions R, S,T and V.

[13] **PERFORM** the following as required:

[13.1] IF Automatic Voltage Control is in service,
THEN
ADJUST Main Generator VARs **USING**
[HS-57-22] Exciter Voltage Auto Adjuster as necessary during power escalation. ________

[13.2] **IF** necessary to remove Automatic Voltage Control from service,
THEN
PERFORM required steps in Appendix E. ________

[13.3] IF Automatic Voltage Control is NOT in service,
THEN
ADJUST Main Generator VARs **USING**
[HS-57-23] Exciter Voltage Base Adjuster as necessary during power escalation. ________

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

NOTES

1) Deboration using a mixed bed demin is normally used when less than 50 ppm but may be used between 50-100 ppm if recommended by Chemistry or if required due to dilution capability NOT available.
2) Every effort to maintain core thermal power 10 minute average less than 3455 MWt should be made. Core thermal power one hour average SHALL not exceed 3455 MWt.

[14] **PERFORM** the following as necessary to maintain T-avg and thermal power at desired value:

[14.1] **ADJUST** RCS boron concentration in accordance with 0-SO-62-7, Boron Concentration Control ☐
OR

[14.2] **ADJUST** control rod position in accordance with 0-SO-85-1, Control Rod Drive System ☐
OR

[14.3] **ADJUST** turbine load slightly ☐
OR

[14.4] **DEBORATE** RCS periodically using a mixed bed demin in accordance with 1,2-SO-62-9 (if RCS boron less than 100 ppm) ☐

[15] **IF** core thermal power 10 minute average exceeds 3455 MWt **OR** an increasing power trend which will exceed 3455 MWt is observed, **THEN**
ENSURE PROMPT action is taken to decrease reactor power as necessary. [C.1]

_____ 1st

_____ CV

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

NOTE

Appendix D provides recommended power values for maintaining condensate pressure if secondary plant equipment must be removed from service for maintenance.

[16] **IF** unit shutdown or load reduction is required, **THEN**

GO TO Section 5.3 of this instruction. _____

[17] **IF** Load Follow is required, **THEN**

PERFORM Section 5.5, *Load Follow Operations*. _____

[18] **IF** at end of cycle and a power coastdown is required, **THEN**

PERFORM Section 5.4, *Power Coastdown At End Of Life*. _____

END OF TEXT

Facility: Sequoyah Scenario No.: 3 Op Test No.: 2010302

Examiners: ____________ Operators: ____________

____________ ____________

____________ ____________

Initial Conditions: ≈3-4% RTP, 1A Main Feedwater Pump is in service.

Turnover: Continue plant startup. Operations are complete though 0-GO-4.Section 5.2 Step 2

Target CTs: Start at least 1 EDG prior to placing equipment PTL in ECA.0-0

Start at least 1 CCP (high-head injection pump)

Start at least 1 'A' Train ERCW Pump in an operating safeguards train

Event No.	Malf. No.	Event Type*	Event Description
1. T+0	N/A	R - RO N - BOP	Continue Power Increase to MODE 1
2. T+20	NI04A	I - RO TS - SRO	Intermediate Range channel N-35 failure low (>5% RTP at initiation)
3. T+30	RW01G	C - BOP TS - SRO	Q-A ERCW Pump Over current trip
4. T+40	RX21	I - BOP	PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure
5. T+50	RC07A	C - RO TS - SRO	PORV 68-334 fails open. PORV cannot be closed manually; Block Valve is closed.
6. T+60	TH02B	M - All	RCS Leak
7. T+65	TH02B	M - All	RCS Leak - SBLOCA
8. T+65	ED01 EG08A- EG03B- pre-insert	C - BOP	Loss of offsite power(delayed) resulting in a loss of power to both 6.9 kV Shutdown Boards 1A-A EDG fails to start in Automatic 1B-B EDG trips and cannot be restarted
9. T+65	CV35 pre-insert	C - RO	1A-A CCP fails to start in Automatic
10. T+65	RP16K611A pre-insert	C - BOP	Selected 'A' Train Safety Injection Loads fail to start automatically

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

Scenario 3 Summary

The crew will assume the shift with the unit in startup after a 7-day forced outage maintaining ≈3-4% RTP, controlling SG levels with main feedwater, ready to proceed to MODE 1. Following the briefing summary, the crew will raise reactor power starting in 0-GO-4 Section 5.2 Step 3.

After the crew has entered MODE 1, and at the direction of the Lead Examiner, an Intermediate Range NI will fail requiring action to remove it from service in accordance with AOP-I.01, Section 2.2. SRO will identify Technical Specifications 3.3.1.1 Table 3.3-1 functional unit 5 Action 3, 3.3.3.7 Table 3.3.10 instrument 17 Action 1.

At the direction of the Lead Examiner, Q-A ERCW Pump will trip. The crew will refer to alarm response procedures (ARPs) 0-AR-M27-A A-1, C-2, 0-AR-M27-B-A E-3, E-4 and should go to AOP-M.01, Section 2.1 that directs manually starting J-A ERCW Pump and repositioning the DG Power Selector, 0-XS-67-285 for proper safeguards actuation. SRO will identify Technical Specifications 3.7.4.

At the direction of the Lead Examiner, PT-1-33, Main Steam Header Pressure Transmitter will fail low affecting the Steam Dumps, which will all close and Main Feed Pump Control that will cause the 1A Main Feed Pump to go to minimum speed. The crew will maintain RCS temperature on the SG atmospheric relief valves according to 1-SO-1-2, Section 7.1, Steam Dump System Shutdown and respond to annunciators for SG level deviation using 1-AR-M5-A, B-7- LS-3-42D STEAM GEN LVL HIGH-LOW DEVIATION directing implementation of AOP-S.01, Loss of Normal Feedwater Section 2.3, Loss of Main Feedwater Pump Control.

At the direction of Lead Examiner direction, a Pzr PORV will fail open and cannot be closed causing an uncontrolled RCS Pressure drop. The crew should close the block valve (PORV will remain in mid-position), refer to ARPs 1-AR-M5-A E-2 and 1-AR-M5-C B-6 and SRO direct entry into AOP-I.04, section 2.1. The crew should also refer to 0-SO-68-3, section 8.3 to close the associated block valve. SRO will identify Technical Specifications 3.2.5.b and LCO 3.4.3.2 action b (according to TS Bases for PORV OPERABILITY- not OPERABLE).

The RCS leak occurs and progresses into a SBLOCA. The crew responds to alarms by referring to ARPs 1-AR-5-C B-1, B-3, 1-AR-M6-E C-6 directing them to AOP-R.05 Section 2.1 for lowering Pzr level and a challenge to VCT Make-up capability. Subsequently the crew will initiate a reactor trip and enter E-0.

1A-A EDG automatic start fails and must be manually started. 1B-B EDG trips and cannot be re-started. The crew must manually start 1A-A EDG to avoid entering ECA-0.0 [Note; ECA-0.0 MAY be entered briefly (through Step 8) prior to starting EDG].

Additionally, selected 'A' Train Safety Injection Loads: 1A-A CCP, 1A-A MD AFW Pump, Train A SI signal to TDAFW Pump and ERCW Pumps J-A, Q-A, K-A and R-A (if selected) fail to automatically start. Starting the CCP is critical to a SBLOCA with the unavailability of the 2nd CCP due to the loss of AC power. Re-starting the J-A ERCW Pump is critical for long term cooling of 1A-A EDG and 1A Header ECCS loads due to the previous Q-A Pump loss.

EOP flow: E-0 – E-1 – FR-Z.1 – E-1 – ES-1.1

The scenario may be terminated at the direction of the Lead Examiner, when ES-1.1, Post LOCA Cooldown transition is determined.

PSA significant task: Start EDG, 1A-A CCP and J-A ERCW Pump
PSA significant DAS: SBLOCA
PSA significant component failure: Pzr PORV, 1A-A EDG, Q-A ERCW Pump

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)
0	4.0	73.1	180.0	-430.8	-54.7	---	1710.0	---	---	---	0.1
1	9.0	160.6	184.0	-381.6	-55.6	39.3	1703.7	-6.3	249	0	0.7
2	15.0	261.9	186.0	-351.2	-63.8	79.0	1691.0	-12.7	502	0	1.8
3	15.0	262.7	188.0	-332.1	-79.9	-2.1	1691.3	0.3	0	4	3.1
4	18.0	310.6	190.0	-306.7	-102.9	45.5	1684.0	-7.3	290	0	4.5
5	20.0	343.2	192.0	-283.4	-132.7	39.0	1677.8	-6.3	250	0	5.9
6	22.0	374.5	194.0	-260.4	-168.7	44.4	1670.7	-7.1	285	0	7.4
7	27.0	451.7	196.0	-233.7	-211.0	92.7	1655.8	-14.9	598	0	9.1
8	30.0	498.7	200.0	-191.5	-259.7	53.6	1647.2	-8.6	347	0	11.0
9	30.0	499.8	200.0	-190.8	-314.3	55.0	1638.4	-8.8	357	0	12.8
10	30.0	500.8	201.0	-180.8	-373.0	49.8	1630.4	-8.0	324	0	14.5
11	30.0	501.8	202.0	-170.8	-434.3	52.3	1622.0	-8.4	342	0	16.1
12	30.0	502.8	203.0	-160.8	-496.9	53.7	1613.4	-8.6	352	0	17.4
13	30.0	503.8	204.0	-150.9	-559.9	54.0	1604.7	-8.7	356	0	18.7
14	30.0	504.8	205.0	-141.3	-622.2	53.8	1596.1	-8.6	356	0	19.8
15	30.0	505.9	207.0	-122.9	-683.5	43.8	1589.1	-7.0	291	0	20.8
16	30.0	506.7	208.0	-113.5	-743.0	51.0	1580.9	-8.2	339	0	21.7
17	30.0	507.7	209.0	-104.2	-800.6	49.2	1573.0	-7.9	328	0	22.5
18	30.0	508.6	209.0	-103.8	-855.9	55.8	1564.1	-8.9	373	0	23.2
19	30.0	509.6	209.0	-103.3	-908.7	53.4	1555.5	-8.6	359	0	23.9
20	30.0	510.7	209.0	-102.9	-958.9	50.8	1547.4	-8.1	342	0	24.5
								Total	6642	4	

1000	MWD/MTU
6820	BAT ppm

Hold Tavg = Tref +/- 1.5F

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

Reason for Maneuver: Reactor/Plant restart following forced outage- 30% hold

Date: Today

RxEng Name: J. Sidekick

Comments: none

SHIFT TURNOVER CHECKLIST Page 1. of 3 Today

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

Mode 2, 3-4% Power -- MWe
PSA Risk: Green
Grid Risk: Green
RCS Leakage ID .02 gpm, UNID .01 gpm

NRC phone Authentication Code

Until 0800 XXXX
After 0800 YYYY

Common Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner	RTS
None	None	- - - -	- - - -	- - -

U-1 Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner	RTS
None	None	- - - -	- - - -	- - -

Protected Equipment

- ***None***

Shift Priorities

- ***Following a 7-day forced outage, raise power to 13-15%; prepare for Main Generator Synchronization.***
- **According to TI-40, no fuel failures, CPL trending not required prior to 50%.**
- ***Section 5.2 Step 3, Perform Section 5.3, Turbine Roll in parallel is being prep'ed/briefed by another SRO/RO;***

Part 2 – Performed by on-coming shift

☐ Verify your current qualifications (re: OPDP-1 Section 7.3 F.)

☐ Review Operating Log since last held shift or 3 days, whichever is less.

Review the following for changes since last shift turnover:

☐ ODMIs/Standing Orders/ Shift Orders
☐ TACFs
☐ LCO actions
☐ Operator workarounds, burdens, and challenges
☐ PERs (applicable to unit)
☐ Immediate required reading

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

☐ Walk down of MCR Control Boards

SHIFT TURNOVER CHECKLIST Page 2. of 3 Today

MAIN CONTROL ROOM (7690)
• **Train A Week** • **0-SI-SXX-068-127.0 Appx. E, RCS & Pressurizer Temperature & Pressure Limits in progress per Sect. 1.2.1.E.**
OUTSIDE (7666) [593-5214]
• **None**
AUXILIARY BUILDING (7775)
• **None**
TURBINE BUILDING (7771) (593-8455)
• **None**

SHIFT TURNOVER CHECKLIST

Page 3. of 3

Today

Disabled Annunciators

PANEL	WINDOW	ANNUNCIATOR	WO / PER Number

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number

MCR WO LIST

ID And Noun Name	Panel	Problem Description	WO/PER Number

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1710** ppm Today		BA Controller Setpoint: **46.3%** *	RCS B-10 Depletion: **52** 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, **50** 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: **136**	Rod Steps: **3**

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%	**196** Steps on bank D	**99** gallons
30%	**173** Steps on bank D	**292** gallons
50%	**151** Steps on bank D	**481** 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: 1	Number of borations: 0	Rod steps in: 0
Gallons per dilution: 12	Gallons per boration: 0	Rod steps out: 0
Total amount diluted: 12	Total amount borated: 0	Net change: 0 IN/Out

Current Shift Estimated Reactivity Manipulations

Number of dilutions: *	Number of borations: 0	Rod steps in: 0
Gallons per dilution: *	Gallons per boration: 0	Rod steps out: 0
Total expected dilution: *	Total expected boration: 0	Net change: 0 In/Out

Remarks: * Per the RE Reactivity Spreadsheet
Rx Power: 3-4% Burnup: 10,000 Mwd/mtU Xenon: -54.7 pcm, equilibrium
Samarium: 544 pcm

Last Dilution Completed: *

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	1710	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	115	Today / Now	68	Today / Now
15 gpd (30 min increase)	cpm	265	Today / Now	83	Today / Now
30 gpd leak equivalent	cpm	490	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	1165	Today / Now	455	Today / Now
150 gpd leak equivalent	cpm	2290	Today / Now	870	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cfm	40	Today / Now	40	Today / Now

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

TVA

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 0067

Quality Related

Level of Use: Continuous Use

Effective Date: 04-08-2010

Responsible Organization: OPS, Operations

Prepared By: Olivia Taylor

Approved By: W. T. Leary

Current Revision Description

Added guidance to Section 5.3 pertaining to requirements for turbine roll with turning gear secured for a period of time. Also outlined Limitations of turning gear time requirements and turbine shaft eccentricity limits (PER 118536, PCR 10000256)

THIS PROCEDURE HAS THE POTENTIAL TO IMPACT REACTIVITY.

Table of Contents

Table of Contents (continued)

ATTACHMENTS

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 MFW Bypass valves in **AUTO** to 30% Reactor Power with MFW 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*

MM. 2-SO-98-1, Distributed Control System (DCS)

2.2 Developmental References

A. FSAR Sections 10.2.2, 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

F. VTD-W120-6510, *Main Steam Turbine Operation Instructions*.

G. NERC Reliability Standard, VAR-002-1.1b

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. TI-28, Figure A.15 is designed to limit the maximum rotor stress during the entire program of acceleration, synchronizing, holding at minimum load, followed by increasing load to full capability. The recommended time periods for each phase of the program are determined by the measured first-stage metal temperature at the time of starting.

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.

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.

3.1 Precautions (continued)

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. 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)

Q. The turbine should not be on hold at 1800 rpm for longer than 2 hours when the generator is not synchronized to the grid. Longer than 2 hours will cause overheating of the turbine blading (last row).

3.1 Precautions (continued)

R. Voltage Control

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Operation of the Main Generator without Automatic Voltage Control could impact grid voltage requirements. Refer to GOI-6 for MVAR limits.
2. When the Main Generator is connected to the grid, the voltage regulator shall be operated in Automatic, unless coordinated with the Transmission Operator (SELD).
3. Main Generator operation outside of the Transmission Voltage Schedule requires ~~coordination with the Transmission Operator, and~~ notation in the operator's Log of time, reason, and that the Transmission Operator notification was made.
4. When directed to modify voltage, the Generator Operator shall comply (within plant procedural requirements) or provide an explanation of why the schedule cannot be met.
5. While the Main Generator is tied to the grid perform the following:
    a. The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between AUTO and Manual as soon as practical but notification shall be within 30 minutes.
    b. The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfers between Manual and Auto.
    c. All position changes (to and from ~~Auto or Manual) of the~~ Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration and notifications made.

3.1 Precautions (continued)

8. Reliability Directives and Protective Relay/Equipment Failures

> **NOTE**
>
> Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Plant Operations shall notify the Transmission Balancing Authority (BA) or Transmission Operator of protective relay or equipment failures that creates a creditable risk to Plant Generation. A creditable risk to generation represents a potential reduction in transmission system reliability.

2. Reliability Directives to the Generator Operator are via the Balancing Authority or Transmission Operator. Required action time may range from immediate to no longer than 30 minutes. Actions shall be taken without delay. The directives may be associated with preventing or clearing Local System issues, or neighboring system issues.

3. Plant operations shall take timely actions as directed by the Balancing Authority or Transmission Operator to mitigate critical conditions to return the bulk electrical system to a reliable state. Plant operations shall comply with Balancing Authority or Transmission Operator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements.

4. Plant Operations shall immediately inform the Balancing Authority or Transmission Operator of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

3.2 Limitations (continued)

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.

M. The #3 Heater Drain Tank should remain drained with LCV-6-105A and B failed open (per 1,2-SO-5-2) until reactor power exceeds ~45-50%. This will prevent intermediate heater string isolations if a turbine trip occurs at lower power levels. If a level is established in the #3 Heater Drain Tank prior to exceeding P-9 setpoint (50% power), a turbine trip will result in Intermediate Pressure Heater string isolation(s).

N. The following Main Turbine vibration limitations and actions should be adhered to:

1. Vibration levels which exceed 7 mils (alarm set-point) should be verified by Predictive Maintenance Group.

2. Vibration levels greater than 7 mils and less than 14 mils should be continuously monitored by Predictive Maintenance Group.

3. IF vibration level is greater than or equal to 14 mils, THEN TRIP the turbine.

4. Limit temperature differential between any condensers to less than 50°F. Exceeding this limit results in improper bearing loading and misalignment, thus potentially increasing main turbine vibration. Limitation is based on the temperature as measured in the LP turbine exhaust hood. (PER 178439)

5. IF temperature differential between the condensers is greater than or equal to 50°F, based on the temperature as measured in the LP turbine exhaust hood, **THEN TRIP** the turbine.(FSAR 10.2.2, VTD-W120-6510, PER 178439)

3.2 Limitations (continued)

O. If Turbine seals have been in service with Turbine Turning Gear secured and unit is to be returned to operation, then both of the following limitations apply:

  1. Turbine is required to be placed on turning gear for 10 times as long as period it was stopped (up to a maximum of 4 hours).

  2. If eccentricity is higher than normal, turbine is required to be left on turning gear until eccentricity indication has reached and has been maintained at its normal minimum value for at least one hour.

STARTUP 1 Unit 1 Date Today

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. RO1

[2] **ENSURE** Precautions & Limitation of Section 3.0 have been reviewed. RO1

[3] **ENSURE** Reactor Power is between 1 and 4% ☑

[4] **UNIT 1 ONLY- ENSURE** four MFW Bypass valves in **AUTO**. (**N/A** if manual MFW Bypass valve operation is allowed by Plant Manager) ☑

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

Print Name	Initials
Senior Reactor Operator	S
Reactor Operator 1	RO1
Reactor Operator 2	RO2
Cond DI AUO	CDA
Shift Technical Advisor	ST
Shift Manager	SM

STARTUP 1 **Unit** 1 **Date** To day

5.0 INSTRUCTIONS

5.1 Actions To Be Performed Prior To Increasing Reactor Power

[1] **ENSURE** Prerequisites complete. S

NOTE

Steps 5.1[2] through5.1[12] can be performed out of sequence.

[2] **IF** 0-GO-4, Appendix A, *Mode 2 to Mode 1 Review And Approval* is **NOT** current for this startup,
THEN

is Stdy

INITIATE Appendix A, while continuing with this instruction. N/A

[3] **IF** the Mode 3 to Mode 2 to Mode 1 surveillance checklists are **NOT** current for this startup for Mode 1 entry,
THEN

REQUEST Periodic Test Coordinator to issue the Mode 3 to Mode 2 to Mode 1 surveillance checklists to the applicable departments.

N/A
Initials Time Date

STARTUP 1 **Unit** 1 **Date** today

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

N/A U-1

NOTES

1) **UNIT 2 ONLY** - MFW Bypass valves will be using single element control, which means the desired SG level setpoint will be compared to the actual SG level until adequate steam and feedwater flow are available. Single Element to Three Element control transition occurs at ~13% RTP (.494E6 LBM/HR steam flow per loop).

2) MFW Reg valves may have a positive deviation if reactor power is in the upper range of the control band (1-4%) in the following step.

[4] **Unit 2 Only:** N/A

[4.1] **ENSURE** four MFW Bypass Reg valves in **AUTO.** ☐

[4.2] **ENSURE** MFW Reg. valves have minimal controller deviation. ☐

[4.3] **ENSURE** MFW Reg. valves are **CLOSED** ☐

[4.4] **PLACE** MFW Reg. valves in **AUTO.** ☐

[4.5] **ENSURE** MFW valve control mode in "3 Element Enabled" (click target located in the center of each screen under the appropriate "Loop # Control" button) ☐

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.

[5] **ENSURE** Condensate DI polishing operation in accordance with RCL recommendations. CAN

CAUTION

After refueling operation, NIS indications may be inaccurate until calibration at higher power levels has been performed. RTP shall NOT be allowed to exceed 4% prior to the verification of the proper (or conservative) IR and PR setpoints.

[6] **IF** startup is following a refueling, **THEN**

[6.1] **MAINTAIN** reactor power between 3 to 4%. N/A

STARTUP 1 **Unit** 1 **Date** Today

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

[6.2] **VERIFY** trip and permissive setpoints are within limits in accordance with 0-PI-NUC-092-082.0. [C.2]

N/A
Rx Engineering Date Time

[6.3] **ENSURE** P-10 actuation setpoint is less than the IR trip power level setpoint. [C.2]

N/A
Rx Engineering Date Time

[6.4] **ENSURE** all applicable portions of 0-RT-NUC-000-001.0 are complete.

N/A
Rx Engineering Date Time

NOTES

1) The relationship between T_{AVG} and reactor power with Steam Dumps in Pressure Mode while maintaining Steam Pressure is 0.52deg. F / %

2) Due to instrument inaccuracies, the steam dump or SG atmospheric relief valve setpoint of 84% or 1005 psig may be ±1% or ±12 psig off.

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

[8] **ENSURE** 0-SI-NUC-000-038.0 shutdown margin calculation is complete (**N/A** if <u>**NOT**</u> required). JT

[9] **ENSURE** containment air temperatures are within limits in accordance with 1,2-SI-OPS-000-003.D, App. B. (TS 3.6.1.5) RC

[10] **INITIATE** Appendix E , *Preparations for Turbine Roll.* ☑

[11] **INITIATE** Appendix F, *Preparations for Generator Synch.* ☑

STARTUP 1 **Unit** 1 **Date** today

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

[12] **REVIEW** TI-40 to determine applicable Preconditioned Power Levels and Maximum Allowable Rates of Power Increase. S

[13] **VERIFY** all applicable action steps in Section 5.1 are complete or initiated. S

[14] **ENSURE** Appendix A, *Mode 2 to Mode 1 Review and Approval* completed to verify all restraints to Mode 1 entry have been resolved and approvals for mode change granted.

SM — SM Signature

Today — Date

~2hrs ago — Time

END OF TEXT

STARTUP / **Unit** / **Date** ______

5.2 Reactor Power Ascension To Between 13% And 15% RTP

NOTE

The steam generator level operator is in control of unit startup until the MFW Reg. valves are in **AUTO** and controlling level. [C.5]

[1] **REVIEW** plant parameters and indications, **AND**

VERIFY stability prior to reactor power escalation. ☑

NOTES

1) Adjusting blowdown flow will provide an additional method of controlling SG water inventory. (Close blowdown isolation valves only if level cannot be maintained)

2) Prior to increasing reactor power above 5%, SG blowdown should be in service.

3) Maximum blowdown rate is less than or equal to 270 gpm. Each steam generator flow, up to 60 gpm is indicated on panel L-357 located in the A.B. Supply Fan Rm. Minimum blowdown rate equals 5 gpm for each steam generator. Final blowdown rate should be determined by chemical analysis.

4) Computer points require a prefix 0, 1, or 2 be placed in front of the point number; for example, 1F2261A.

[2] **IF** SG blowdown is in service,
THEN
ADJUST FIC-15-43 as desired.
(plant computer pt. F2261A) ______

STARTUP_________ Unit _____ Date ________

5.2 Reactor Power Ascension To Between 13% And 15% RTP (continued)

NOTES

1) 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.

2) Recommended dilution rate is 50 to 75 gallon batches every 12 to 15 minutes for a steady power increase. Rod movement should be limited to 1/2 step increments approximately every 1 1/2 minutes. Dilution and rod movement rates may be adjusted depending on SG level control stability.

3) Control Rod withdrawal and / or dilution requirements may be significantly impacted by the change in core reactivity due to changing Xenon concentration.

[3] **INITIATE** a methodical and deliberate reactor power increase by manual adjustment of the control banks or by diluting the RCS. ☐

MODE 1

[4] **WHEN** reactor power is above 5%,
THEN
LOG Mode 1 entry in the Unit Narrative Log. ☐

[5] **UNIT 1 ONLY:**
MAINTAIN the SG levels on program by periodically adjusting the MFW Bypass controller level setpoints using Appendix B and C. ☐

[6] **UNIT 2 ONLY:**
MAINTAIN the SG levels on program by periodically adjusting the MFW Bypass controller level setpoints using Appendix B and 2-SO-98-1, *Distributed Control System (DCS)*. ☐

STARTUP_________ Unit _____ Date ________

5.2 Reactor Power Ascension To Between 13% And 15% RTP (continued)

[7] **IF** Turbine roll in parallel with power increase is desired,
THEN
PERFORM Section 5.3 in parallel
with the remainder of this section. _________

[8] **IF** the intermediate range rod stop setpoint is reached before P-10 energizes, **THEN**

[8.1] **STOP** the power escalation. ☐

[8.2] **CONTACT** Reactor Engineering to evaluate power range calibration. [C.3]

__________ __________ __________
Initials Time Date

[9] **WHEN** reactor power is greater than or equal to 10% on at least 2 out of 4 PRMs, **THEN** [C.1] [C.3]

[9.1] **VERIFY** annunciator XA-55-4A, window D-5:

P-10
NUCLEAR
AT POWER
PERMISSIVE

is **LIT.** ☐

[9.2] **VERIFY** annunciator XA-55-4A, window B-5:

P-7 LOW
POWER TRIP
BLOCK

is **DARK.** ☐

[9.3] **COMPARE** the highest reading PRM with the highest reading loop ΔT indication to be within 5% of each other. [C.1] [C.3] ☐

5.2 Reactor Power Ascension To Between 13% And 15% RTP (continued)

[9.4] **IF** the above conditional response is **NOT** attained, **THEN**

[9.4.1] **STOP** the power increase. ☐

[9.4.2] **NOTIFY** the SRO

_____________ _____________ _____________
Initials Date Time

> **NOTE**
>
> The following step will block both IR (25%) and PR (25%) low power reactor trips.

[10] **BLOCK** the IR HI FLUX reactor trip and PR LO Range HI FLUX reactor trip by performing the following:

[10.1] **PLACE** IRM TRIP BLOCK P-10 **[HS-92-5003]** **AND** **[HS-92-5004]** to **BLOCK**. ☐

[10.2] **VERIFY** annunciator XA-55-4A, window C-2:

INTERMED RANGE
TRAINS A & B TRIP
BLOCKED

is **LIT**. ☐

[10.3] **RELEASE** **[HS-92-5003]** **AND** **[HS-92-5004]**. ☐

[10.4] **PLACE** PRM LOW POWER TRIP BLOCK P-10 **[HS-92-5005]** **AND** **[HS-92-5006]** to **BLOCK**. ☐

[10.5] **VERIFY** annunciator XA-55-4A, window D-1:

POWER RANGE
LOW SETPOINT
TRAINS A & B TRIP
BLOCKED

is **LIT**. ☐

STARTUP________ Unit _____ Date ________

5.2 Reactor Power Ascension To Between 13% And 15% RTP (continued)

[10.6] **RELEASE** [HS-92-5005] **AND** [HS-92-5006]. ☐

NOTES

1) **UNIT 2 ONLY -** SG MFW Bypass and MFW Reg. valve controllers are controlled by one of the following:
   - Single element control - desired SG level setpoint will be compared to the actual SG level. Control is based only on SG level as the feedback for controlling the valve operation.
   - Three element control - uses SG level, feedwater flow, and steam flow as inputs for controlling the MFW Bypass and MFW Reg. valves. Desired mode of operation.

2) **UNIT 2 ONLY -** The change from single element to three element control:
   - Observed on the DCS Operator Display monitors by accessing the Feedwater Valve Control screen and looking below the loop Main Feedwater Valve display. The Control Status text will change from "Single Element" to "Three Element".
   - Uses Total Steam Flow demand as the input for three element control. The swap over to three element control may occur before or after the following step.

[11] **WHEN** reactor power is between 13 and 15%,
THEN

[11.1] **STOP** power increase. ☐

[11.2] **STABILIZE** the plant. ☐

[11.3] **UNIT 2 ONLY:**

- **MONITOR** for swap over from single element to three element control in the DCS Feedwater System ☐
- **IF** damping of SG level oscillations is required, **THEN REFER TO** 2-SO-98-1 ☐

[12] **IF** rolling of second MFWP on recirc without pumping forward for testing or maintenance is desired,
THEN
PLACE second MFPT in service by performing the following:

[12.1] **RECORD** which MFPT is to be tested.

_________MFPT _________

5.2 Reactor Power Ascension To Between 13% And 15% RTP (continued)

[12.2] **PLACE** second MFPT in service in accordance with 1,2-SO-2/3-1 ☐

[13] **IF** unit shutdown is required,
THEN
GO TO 0-GO-6, *Power Reduction From 30% Reactor Power To Hot Standby.* ________

[14] **ENSURE** steps 5.2[1] through 5.2[12] of this section complete. (applicable steps) ________

> **NOTE**
>
> If Section 5.3 has already been initiated, then performance should continue at the step in effect.

[15] **IF** rolling the turbine,
THEN
GO TO Section 5.3. ________

END OF TEXT

Appendix A
(Page 1 of 3)

MODE 2 TO MODE 1 REVIEW AND APPROVAL

STARTUP__________ **Unit** ______ **Date** _________

For Your Reference

Signed off in

0-GO-4 Pg 17/115

Sect 5.1 Step 2

1.0 REVIEW AND APPROVAL

[1] **PRIOR to entering Mode 1, an SRO shall review the following:**

[1.1] Active clearances for mode change restraints.

____________ ____________ ____________
Time Date

[1.2] TACF Books.

____________ ____________ ____________
Time Date

[1.3] 0-TI-EXX-000-001.0, Electrical Jumper Control Log.

____________ ____________ ____________
Time Date

[1.4] Active Procedures Book.

____________ ____________ ____________
Time Date

[1.5] **IF** applicable, **OBTAIN** and **REVIEW** the Mode 3 to Mode 2 to Mode 1 checklists from the responsible departments and **ENSURE** required surveillance testing for Mode 1 entry has been completed.

____________ ____________ ____________
Time Date

[1.6] **REVIEW** the Unit Configuration Log for impacts into Mode 1.

____________ ____________ ____________
Time Date

[1.7] **REVIEW** Annunciator Disablement Log, OPDP-4.

____________ ____________ ____________
Time Date

Appendix A
(Page 2 of 3)

STARTUP________ **Unit** _____ **Date** ________

1.0 REVIEW AND APPROVAL (continued)

[1.8] **REVIEW** Plant Computer Point Disablement Log 0-PI-OPS-301-001.0.

____________ ____________ Time ____________ Date

[1.9] **ENSURE** a board walk-down is performed by a designated SRO to verify proper equipment alignment. (**REFER TO** appropriate CRO and OATC PIs for guidance) **[C.8]**

____________ ____________ Time ____________ Date

> **NOTE**
>
> Tech Spec and TRM LCO 3.0.4 govern entering Mode 1 if any LCO requirement applicable in Mode 1 is NOT met. Therefore, mode change is NOT allowed while in a Tech Spec or TRM action UNLESS the exceptions and/or allowances stated in LCO 3.0.4 can be applied.

[1.10] **REVIEW** all Tech Spec and TRM actions which have been entered on affected unit and common equipment to verify that mode change is acceptable.

____________ SRO ____________ Time ____________ Date

____________ SM ____________ Time ____________ Date

[1.11] **IF** Tech Spec or TRM LCO 3.0.4 will be invoked for mode change, **THEN**
ENSURE requirements of 0-TI-OPS-000-911.0, *Instructions for Using LCO 3.0.4 (b)*, for use of LCO 3.0.4 are satisfied.

____________ SRO ____________ Time ____________ Date

Appendix A
(Page 3 of 3)

STARTUP_________ **Unit** _____ **Date** ________

1.0 REVIEW AND APPROVAL (continued)

[2] SHIFT MANAGER (SM) HOLD POINT

A. SM has conferred with Unit Outage Manager to **ENSURE** Tech Spec and non-Tech Spec work related activities are completed or will **NOT** prohibit entry or impact continued operation in Mode 1.

SM	Time	Date

B. SM has conferred with the Modifications Manager or designee to ENSURE that there are no open DCN/ECNs that would prohibit entry into Mode 1.

SM	Time	Date

C. SM has conferred with the Fire Protection Manager or his designee to ensure limitations as stated in 0-TI-SXX-000-016.0 are **NOT** exceeded.

SM	Time	Date

D. SM has reviewed above and grants approval for entry into Mode 1.

SM	Time	Date

[3] OPERATIONS SUPERINTENDENT HOLD POINT

A. Operations Superintendent or his designee concurs and grants approval to proceed to Mode 1.

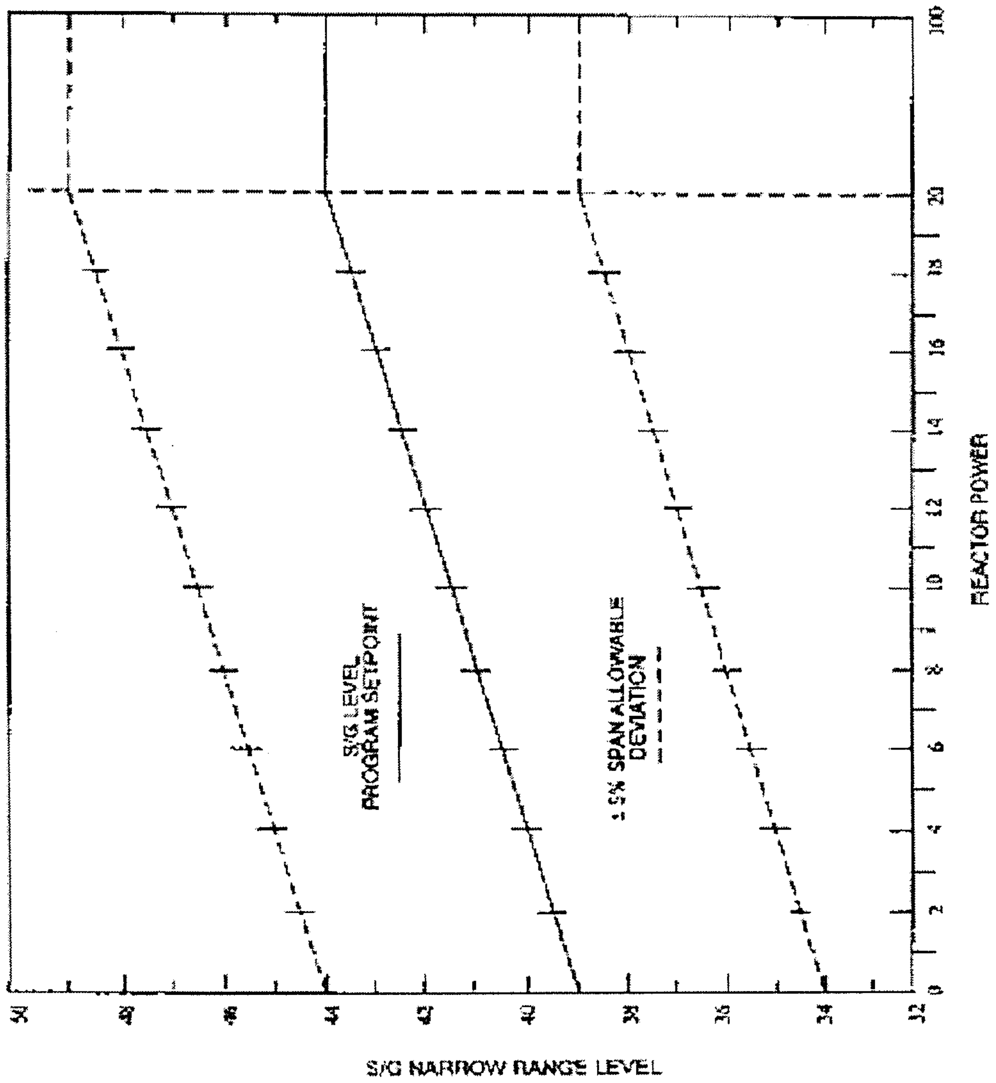
Operations Superintendent	Date	Time

Appendix B
(Page 1 of 1)

FIGURE 1 STEAM GENERATOR LEVEL SETPOINT VS REACTOR POWER

NOTE

This figure does **NOT** represent the automatic S/G level program. The operating band provides a guide for Operators during Unit start-up and is intended to enhance S/G level control during transition from AFW level control to Bypass Reg valve control to Main Reg Valve control.



Appendix C
(Page 1 of 5)

MFW REG AND MFW BYPASS VALVE INSTRUCTIONS

1.0 MFW BYPASS CONTROLLER LEVEL SETPOINT ADJUSTMENTS

CAUTION

It is VERY important that adjustments to MFW Reg valves are made SLOWLY with the operator observing indicators to verify the desired results. This point cannot be over stressed as it is a key point to a successful startup.

NOTES

1) The SG MFW Bypass controller should be adjusted on only <u>ONE</u> SG at a time. [C.5]

2) The MFW Bypass controller should be in MANUAL prior to adjusting setpoint value to prevent controller gain input change.

[1] **WHEN** MFW Bypass controller level setpoint requires adjustment, **THEN**

PERFORM the following steps on one MFW Bypass valve at a time: [C.5] (**N/A** valves **<u>NOT</u>** adjusted)

[1.1] **REFER TO** Appendix B for allowable setpoint.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.2] **PLACE** MFW Bypass controller in **MANUAL**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

NOTE

Allow sufficient time for the MFW Bypass to respond.

[1.3] **STABILIZE** SG level at a desired level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.4] **ADJUST** controller setpoint in small increments while monitoring SG level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

Appendix C
(Page 2 of 5)

STARTUP_________ Unit _____ Date ________

1.0 MFW BYPASS CONTROLLER LEVEL SETPOINT ADJUSTMENTS (continued)

[1.5] **PLACE** MFW Bypass controller in **AUTO**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.6] **ALLOW** the plant to stabilize before adjusting another valve setpoint.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

2.0 DAMPENING SG LEVEL OSCILLATIONS WITH MFW BYPASS VALVES IN SERVICE

NOTES

1) Perform adjustments to one SG at a time. Allow Plant Parameters to Stabilize between valve adjustments. [C.5]

2) The wide range level recorders may respond to a change in level before the narrow range indicators. [C.5]

3) Indicated flowrate on the feed flow indicators may **NOT** reflect an accurate value of flow. The flow indication is to be used as a reference value only. [C.5]

4) The following step may be performed any time SG level oscillates outside the SG level setpoint operating band of ±5 percent.

[1] **IF** required to dampen SG level oscillations at any time during SG level control with the MFW bypass controllers in **AUTO**, **THEN**

PERFORM the following: [C.5]

[1.1] **PLACE** the MFW Bypass controller in **MANUAL**. ☐

[1.2] **CHANGE** valve demand position LESS THAN 10 percent in the opposite direction of valve travel. ☐

[1.3] **PLACE** the MFW Bypass controller in **AUTO**. ☐

Appendix C
(Page 3 of 5)

STARTUP_________ **Unit** _____ **Date** ________

3.0 POSITIONING MFW REG VALVES OFF SEAT DURING UNIT STARTUP

NOTES

1) After a MFW Reg is adjusted DO **NOT** increase reactor power or open MFW Reg further until plant stabilizes and SG level returns to program. ALLOWING PLANT PARAMETERS TO STABILIZE BETWEEN REG VALVE ADJUSTMENTS IS THE KEY TO SMOOTH POWER ASCENSION.

2) Anticipate level shrink when the MFW Reg comes off its seat. [C.5]

3) Use main feedwater flow indication to determine when MFW Reg valves come off seat.

[1] **PERFORM** the following steps to position MFW Reg valves off seat:

[1.1] **REVIEW** plant parameters and indications prior to initial opening.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.2] **OPEN** the MFW Reg valve in small increments while maintaining the MFW Bypass valve between 25 and 60 percent open.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.3] **ENSURE** MFW Bypass valve starts closing when MFW Reg valve is opened.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.4] **ENSURE** SG level returns to MFW Bypass controller setpoint when MFW Reg valve is adjusted.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.5] **ENSURE** SG level and MFW system stabilizes before performing subsequent valve adjustments.

SG-1	SG-2	SG-3	SG-4

Appendix C
(Page 4 of 5)

STARTUP__________ Unit _____ Date _________

3.0 POSITIONING MFW REG VALVES OFF SEAT DURING UNIT STARTUP (continued)

☐ ☐ ☐ ☐

4.0 PLACING MFW REG VALVES IN AUTOMATIC

CAUTIONS

1) **DO NOT place a MFW Reg valve in AUTO without sufficient flow being indicated on the controlling steam/feed flow indicators.**

2) **Both MFW Reg and MFW Bypass controllers should NOT be left in AUTO simultaneously for an extended period.** [C.5].

[1] **WHEN** desired to place MFW Reg valves in **AUTO, THEN PERFORM** the following:

[1.1] **ADJUST** SG level to SG program level setpoint, and
ADJUST the MFW Reg valve to obtain near zero deviation (between -5 percent and +5 percent) while matching steam and feed flows.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.2] **WHEN** controller deviation is near zero, **THEN**

PLACE the MFW Reg valve in **AUTO**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.3] **VERIFY** the MFW Reg valve is controlling SG level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

Appendix C
(Page 5 of 5)

STARTUP_________ **Unit** _____ **Date** ________

4.0 PLACING MFW REG VALVES IN AUTOMATIC (continued)

[1.4] **PLACE** the associated MFW Bypass valve in **MANUAL**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.5] **CLOSE** the MFW Bypass valve in small increments, **AND**

ENSURE the MFW Reg valve responds to control SG level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.6] **WHEN** MFW Reg valve is controlling SG level, **THEN**

PROCEED TO another SG loop.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT

SYSTEM OPERATING INSTRUCTIONS

0-SO-62-7

vfd
Rel
today

BORON CONCENTRATION CONTROL

Revision 58

QUALITY RELATED

PREPARED BY: Olivia Taylor

RESPONSIBLE ORGANIZATION: OPERATIONS

APPROVED BY: A. BERGERON

EFFECTIVE DATE: 02/08/10

LEVEL OF USE: **CONTINUOUS USE**

REVISION DESCRIPTION: Added step to Prerequisite actions to ensure crew has been briefed on expected reactivity changes (1000079).

PERFORMANCE OF THIS PROCEDURE MAY IMPACT REACTIVITY

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Section Title **Page**

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Section Title **Page**

APPENDIXES

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

To provide instructions for operation of the Boron Control System.

1.2 Scope

This instruction provides detailed steps for the following modes of operation:

Automatic Makeup
At Power Routine Dilution
Dilute and Alternate Dilute
Borate
Manual Makeup Control (preferred method for VCT makeup in Modes 1 and 2)
Blending to Spent Fuel Pit Using Boric Acid Blender via SFP Cooling Pump Suction Pressure Indicators
Blending to Spent Fuel Pit Using Boric Acid Blender via Bull Hose Directly to Spent Fuel Pit
Blending to RWST Using Boric Acid Blender
Makeup to the Reactor Coolant System from the RWST in modes 1-4 when the Automatic/Manual Makeup is unavailable.
Manual Makeup to the Reactor Coolant System from the RWST in modes 5 or 6
Blending to Transfer Canal Using Boric Acid Blender
Blending to the Holdup Tank using Boric Acid Blender
Flushing Unit 1 Blender/Piping Using Primary Water (Maintenance Activities)
Flushing Unit 2 Blender/Piping Using Primary Water (Maintenance Activities)
UNIT 2 Alternate divert path using RCL sampling system

2.0 REFERENCES

2.1 Performance References

A. Procedures
   1. 0-SO-62-10, Boric Acid Batch, Transfer, and Storage System
   2. 0-SO-78-1, Spent Fuel Pit Cooling System

B. Technical Instructions - TI-44, Boron Tables

2.2 Developmental References

A. Procedures
   1. SOI-62.2, Boron Concentration Control
   2. 0-PI-OPS-000-633.0, Aux. Cont. Rm. Switch Alignment Verification
   3. Westinghouse Vendor Manual SQN-VM 4990

B. Technical Specifications
   1. 3.1.1.1
   2. 3.1.1.2
   3. 3.9.1
   4. 3.10.1
   5. Bases 3/4.1.3

C. Technical Requirements Manual
   1. 3.1.2.1
   2. 3.1.2.2
   3. 3.1.2.3
   4. 3.1.2.4
   5. 3.1.2.5
   6. 3.1.2.6
   7. Bases 3/4.1.2

D. FSAR
   1. 9.3.4.2.5
   2. 9.3.4.2.2
   3. 9.3.4.2.6
   4. 15.2.4
   5. 15.2.14.1
   6. 15.4.6.1

E. TVA Drawings
   1. 47W809-1
   2. 47W809-2
   3. 47W809-5

3.0 PRECAUTIONS AND LIMITATIONS

A. The mode selector switch should be returned to the **AUTO** makeup mode after any dilution or boration operation. The control switch must be turned to **START** in order for the auto makeup to function.

B. At least one Reactor Coolant Pump or one RHR Pump must be in operation during dilution operations. **[C.6]**

C. Maintain Pressurizer boron concentration within 50 ppm of reactor coolant loop boron concentration. This can be accomplished by turning pressurizer heaters on and allowing sprays to maintain RCS pressure within program. If Normal Spray is NOT available, then Auxiliary Spray should be used (1, 2-SO-62-1) in conjunction with pressurizer backup heaters.

D. Axial flux difference should be maintained within limits by using the control bank of rods while changing boron concentration.

E. Prior to making a positive reactivity change, Tech Specs and TRM should be referenced to ensure the unit is not in a LCO action that prohibits a positive reactivity change. **[C.1]**

F. A boron sample should be obtained whenever reactor makeup water is added to the VCT, unless the unit is at power and results of the makeup are as expected.

G. When making an RCS dilution of ≥ 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. **[C.5]** **[C.7]**

H. Simultaneous makeup to the RWST and the RCS should be avoided to prevent the possibility of injecting unborated (or under borated) water into the core. **[C.4]** **[C.6]** **[C.7]**

I. Reactivity balance calculations are required for any power changes more than 1%, except when immediate boration is required to maintain rods above the insertion limit or as required during an Rapid Shutdown or Load Reduction (AOP-C.03) or dropped/misaligned rod recovery (AOP-C.01). Although stated in the procedure that only one calculation is required for a major change in Reactor Power, calculations should be current and take into account the time dependency of parameters used in the calculation. [e.g. one calculation to decrease RX power to 70% power to remove a MFP is acceptable]. In the event of a large power manipulation (GO startup or shutdown) several calculations will be required. A calculation should be performed for the increase to 30% Reactor power, another for an increase to 50%, and so on. These calculations may be correlated to GO plateaus.

3.0 PRECAUTIONS AND LIMITATIONS (CONTINUED)

J. Boric Acid Controller adjustment is required for B-10 depletion for automatic and manual makeup to improve the accuracy of the blend. The B-10 depletion value for each unit can be obtained from the Rx Eng Information file located on the site intranet. Reactor Eng Information ICON can be found on the control room PC's.

K. An unanticipated power change greater than 5 MWT, rod motion greater than 1 step (in or out), or T_{AVG} greater than 0.5°F, require a PER and should be evaluated as a potential reactivity management event per SPP-10.4, Reactivity Management Program.

L. Boron concentration measurement inaccuracies and integrator calibration tolerance may result in a small difference between RCS boron concentration and blend boron concentration. This may result in a small change in Tavg (~1/4°F) and thermal power (by a few megawatts) after makeup.

M. Manual Makeup (Section 6.5) of approximately 200 gallons or less is preferred over allowing the system to automatically make up in Modes 1 and 2. Performing manual makeup and limiting the volume of makeup is preferred to reduce the impact on reactivity, RCP seal performance (due to reduced pressure/temperature transients) and RCS chemistry (due to reduced VCT pressure changes). During transient conditions, emergencies, or during plant cooldown, automatic makeup may be used as necessary.

N. The potential exists that the blender piping contains primary water. This will result in a dilution and a small reactivity addition.

O. Completely emptying the BAT's for all valve work is not required to establish a safe work boundary. The valves on the lower portions the tanks require an empty tank to establish safe conditions. The tank drain, level instrument isolation and pump suction line are all at or near the bottom of the tank. These are listed in the table below:

BAT A	BAT C	BAT B
1-VLV-62-1049	0-VLV-62-1049	2-VLV-62-1049
1-VLV-62-1058	0-VLV-62-1058	2-VLV-62-1058
1-VLV-62-1088	0-VLV-62-1088	2-VLV-62-1088

The other valves associated with the Boric Acid Transfer Pumps can be worked with some level remaining in the tanks. As a margin of safety, a maximum of 85% should be used to establish safe working conditions.

Unit_______________ Date_____________

4.0 PREREQUISITE ACTIONS

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

[1] **ENSURE** the instruction to be used is a copy of the effective version. _________

[2] **ENSURE** Precautions and Limitations, Section 3.0, has been reviewed. _________

[3] **REVIEW** the following Status Files for any off-normal alignments that may impact performance:

Status File	✓
Unit 1	☐
Unit 2	☐
Radwaste	☐

____

[4] **ENSURE** Chemical and Volume Control System is in operation. _________

[5] **ENSURE** the operating crew has been briefed for any reactivity changes that will occur due to performance of the applicable procedure section. _________

[6] **IF** in modes 1, 2, or 3, **THEN**

ENSURE requirements of TRM L.C.O. 3.1.2.6 are met,
OR
COMPLY with applicable actions. _________

[7] **IF** in modes 4, 5, or 6, **THEN**

ENSURE requirements of TRM L.C.O. 3.1.2.5 are met,
OR
COMPLY with applicable actions. _________

[8] **IF** Primary Water required for the evolution to be performed, **THEN**

ENSURE Primary Makeup Water system in service. _________

Unit__________ Date__________

4.0 PREREQUISITE ACTIONS (Continued)

NOTE The following step is performed at the discretion of the RO and/or SRO.

[9] **WHEN** performing a dilution or boration, **THEN**

[a] **IF** Normal pressurizer spray is available, **THEN** **ENERGIZE** pressurizer heaters so sprays can equalize the boron concentration between the pressurizer and the RCS __________

[b] **IF** Normal pressurizer spray is NOT available, **THEN** **PLACE** Auxiliary Spray in service (1, 2-SO-62-1) in conjunction with pressurizer backup heaters. (N/A if not applicable) __________

[10] **ENSURE** appropriate Valve Checklist has been completed (**N/A** if not applicable).

VALVE CHECKLIST	INITIALS
1-62-7.03	__________
2-62-7.04	__________

[11] **ENSURE** appropriate Power Checklist had been completed (**N/A** if not applicable).

POWER CHECKLIST	INITIALS
1-62-7.01	__________
2-62-7.02	__________

[12] **IF** Boric Acid Tank is the borated water source, **THEN**

ENSURE Boric acid pump aligned properly in accordance with 0-SO-62-10. __________

[13] **IF** using the RWST for the borated water source, **THEN**

ENSURE LCV-62-135 and/or LCV-62-136 **OPERABLE**. __________

NOTE Step **[14]** may be marked N/A if boration must be immediately initiated to maintain shutdown margin OR if performing a rapid boration using FCV-62-138 in preparation for RCS cooldown.

[14] **IF** reactor is subcritical **AND** an RCS boration or dilution is required, **THEN** **PERFORM** Appendix D. __________

Unit________________ Date______________

4.0 PREREQUISITE ACTIONS (Continued)

NOTE 1 Step **[15]** may be marked N/A for any of the following conditions:

- Minor power changes (Reference Section 3.0)
- If boration must be immediately initiated to maintain control rods above the insertion limit
- During an emergency shutdown (AOP-C.03)
- Recovery of a dropped or misaligned rod (AOP-C.01).
- If initiating a rapid boration using FCV-62-138 immediately prior to reactor shutdown in preparation for RCS cooldown.
- During low power physics testing per 0-RT-NUC-000-003.0 if boration/dilution values have been provided and verified by Reactor Engineering.

NOTE 2 Appendix D and E may be used to verify data provided by Reactor Engineering. IV is not required if Appendices are performed by an SRO to verify Rx. Engineering data.

[15] **IF** reactor is critical **AND** RCS boration or dilution will be performed, **THEN**

PERFORM the following:

[a] Appendix E Reactivity balance calculation. __________

[b] Appendix D Calculation for amount of boric acid or primary water (TI-44). __________

[16] **IF** performing a Spent Fuel Pit boration, **THEN**

ENSURE RCL has provided supporting data. __________

Unit______________ Date______________

4.0 PREREQUISITE ACTIONS (Continued)

[17] **REVIEW** Unit and Radwaste Status Files for any off normal alignments that may impact performance. __________

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

Print Name	Initials

[19] **INDICATE** below which performance section of this instruction will be used and the reason for this performance:

☐ 5.0 STARTUP/STANDBY READINESS

☐ 6.0 NORMAL OPERATION

☐ 7.0 SHUTDOWN

☐ 8.0 INFREQUENT OPERATION

REASON:____________________________________
____
____

End of Section 4.0

Unit 1 Date today

6.2 Dilute

CAUTION 1 **When making an RCS dilution of ≥ 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. [C.5] [C.7]**

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. [C.2]**

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.

[1] **ENSURE** unit is NOT in a Tech Spec or TRM action that prohibits positive reactivity additions. **[C.1]** RCl

NOTE HUT level increase of 1% is equal to 1380 gallons (TI-28 fig. C.21).

[2] **ENSURE** sufficient capacity available in the HUT selected to receive expected amounts of CVCS letdown: (**N/A** if not used)

HUT	LEVEL	INITIALS
A	N/A %	n/A
B	↓ %	↓

Unit 1

Date today

6.2 Dilute (Continued)

[3] **ENSURE** makeup system is aligned for **AUTO** operation in accordance with Section 5.1. RO1

[4] **RECORD** the quantity of dilution water required to achieve desired boron concentration using Appendix D. (**N/A** for minor power changes)

XXXX gals RO1

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.

[5] **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)

S
SRO

[6] **PLACE** [HS-62-140A], Boric Acid Supply to Blender Flow Control Switch to the **STOP** position.

_____/_____
1st CV

[7] **PLACE** [HS-62-140B], CVCS Makeup Selector Switch to the **DILUTE** position. _____

[8] **ENSURE** [HS-62-140D], Boric Acid Valve to the Blender is **CLOSED** (Green light is **LIT**). _____

[9] **SET** [FQ-62-142], Batch Integrator for the desired quantity.

_____/_____
1st CV

6.2 **Dilute** (Continued)

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.

[10] **ADJUST** [FC-62-142], Primary Makeup Water Flow Controller for the desired flow rate. ______/______ 1st CV

[11] **PLACE** [HS-62-140A], Boric Acid Supply to Blender Flow Control Switch to the **START** position. ______/______ 1st CV

NOTE Flow oscillations and/or erratic controller response may require manual operation of Primary Water Flow Controller [FC-62-142] until stable conditions exist.

[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]. ________

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.

[13] **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]. ________

Unit______________ Date______________

6.2 Dilute (Continued)

NOTE It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.

[14] **MONITOR** nuclear instrumentation and reactor coolant temperature to ensure the proper response from dilution. ☐

[15] **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. ________

[16] **WHEN** dilution is complete, **THEN**

[a] **PLACE** [HS-62-140A], Boric Acid to Blender Flow Control Switch to the **STOP** position. ____/____ 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**. ________

Unit________________ Date______________

6.2 Dilute (Continued)

[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. ______/______ 1st CV

[b] PLACE [HS-62-140A], BA to Blender Flow Control Switch to **START** position. ☐

[c] ENSURE dilution is logged in Unit Narrative Log. ☐

Unit______________ Date_____________

6.2 Dilute (Continued)

[19] REALIGN the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1. ________

[20] 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.

[21] IF RCS boron sample is required, **THEN**

NOTIFY Chem Lab to obtain RCS boron sample. ________

End Of Section 6.2

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		
N/A		
____ 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. N/A

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.

______
Initials

END OF TEXT

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT

SURVEILLANCE INSTRUCTION

0-SI-SXX-068-127.0

VFU'd
today
RDI

RCS AND PRESSURIZER TEMPERATURE AND PRESSURE LIMITS

Revision 11

QUALITY RELATED

PREPARED BY: Wayne H. Brewer

RESPONSIBLE ORGANIZATION: SE/NSSS

APPROVED BY: Michael Cooper

EFFECTIVE DATE:06/08/2006

LEVEL OF USE: **CONTINUOUS USE**

REVISION DESCRIPTION	Revised to add note to contact the computer engineering group when changes are made to this procedures. Added note to Appendix F to allow the use of points derived from listed computer points for plant computer use.

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Page 1 of 2

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Page 2 of 2

1.0 INTRODUCTION

1.1 Purpose

This Surveillance Instruction (SI) provides detailed steps for ensuring compliance with RCS and pressurizer temperature and pressure limits.

1.2 Scope

1.2.1 Surveillance Tests to be Performed

This Instruction verifies RCS and pressurizer temperature and pressure are maintained within Technical Specification limits during the following plant conditions.

~~A.~~ Cooldown and heatup transients that exceed 30°F in a twelve-hour period or less.

N/A B. Pressure transients in which pressurizer pressure fluctuations exceed 300 psig in a twelve-hour period or less. This instruction should be considered whenever operating auxiliary spray or when increasing/decreasing pressurizer level.

N/A C. Inservice leak and hydrostatic testing operations above the Pressure Temperature Limit Report heatup and cooldown limit curves.

D. Prior to reactor criticality.

E. Reactor is critical and the RCS temperature is less than 551°F with the T_{avg}-T_{Ref} Deviation Alarm not reset.

1.2.2 Requirements Fulfilled

The Surveillance Requirements (SR) listed below are satisfied (in the manner specified) by completion of the associated performance section.

Performance Section	Surveillance Requirements Satisfied
6.1 or 6.2	TS SR 4.4.9.1.1 (full) TRM SR 4.4.9.2.1 TRM SR 4.4.9.2.2
6.3	SR 4.4.9.1.1 (full)
6.4	SR 4.1.1.4.a (full)
6.5	SR 4.1.1.4.b (full)

1.2.3 Modes

Unit operating modes for which Surveillance Requirements covered by this Instruction must be satisfied (applicable modes) and during which tests may be performed (performance modes) are:

Performance Section	Performance Mode	Applicable Mode
6.1 N/A	All	All
6.2	All	All
6.3	All	All
6.4	Modes 1, 2 and 3	Modes 1 and 2 with K_{eff} greater than or equal to 1.0
6.5 N/A	Modes 1, 2 and 3	Modes 1 and 2 with K_{eff} greater than or equal to 1.0

1.3 Frequency/Conditions

NOTE A heatup or cooldown is defined as a temperature change of greater than 30°F in a twelve-hour period or less, OR a pressure change of greater than 300 psi in a twelve-hour period or less.

A. Section 6.1 or 6.2 must be performed every 30 minutes any time a RCS and/or pressurizer heatup or cooldown (as defined above) occurs.

B. Section 6.3 must be performed every 30 minutes during inservice leak and hydrostatic testing operations above the heatup and cooldown limit curves.

C. Section 6.4 must be performed within 15 minutes PRIOR to achieving reactor criticality.

D. Section 6.5 must be performed every 30 minutes when the reactor is critical and the RCS temperature is less than 551°F with the T_{Avg}-T_{Ref} Deviation Alarm not reset.

2.0 REFERENCES

2.1 Performance References

A. SPP 8.1, *Conduct of Testing.*

B. SPP 8.2, *Surveillance Test Program.*

2.2 Developmental References

A. SQN Unit 1 and Unit 2 Technical Specifications.

B. SQN Final Safety Analysis Report (FSAR), Chapter 5.

C. Memorandum from J. H. Miller to P. R. Wallace dated February 4, 1986 (L29 860131 884).

2.2 Developmental References (Continued)

D. Memorandum from J. B. Hosmer to S. J. Smith dated June 8, 1988 (B29 880606 002).

E. Memorandum from Richard G. Simmons, Wyle Labs, to C. R. Favreau dated February 6, 1989 (W01 890203 934).

F. ASME Section III, Appendix G.

G. 10 CFR 50, Appendix H.

H. NRC Bulletin 88-11.

I. DCN-Q06168-A.

J. NER 901398001 (TVA-90-1130) Stepwise Temperature Changes.

K. Integrated Computer System (ICS) Operators Guide and Critical Design Review.

L. TSC 00-14.

3.0 PRECAUTIONS AND LIMITATIONS

A. Stepwise heatup and cooldown should be avoided. The heatup and cooldown rates assume uniform heatup and cooldown transients, not step changes. Restricting a heatup or cooldown to an even rate of change and half the temperature limit in a 30-minute period will provide reasonable assurance that on an hourly basis, the "...in any one-hour period..." part of the applicable limit will be satisfied.

B. The pressurizer surge line thermocouple TI-68-318 [plant computer point T0482A] and the pressurizer liquid space thermocouple TI-68-319 [plant computer point T0480A] should be monitored continuously during letdown and makeup operations to ensure thermal transients on the pressurizer surge line thermal sleeve are minimized. Thermal transients may be caused by the following actions:

1. Rapidly increasing pressurizer level: This action is usually indicative of the cooler RCS liquid being forced up the surge line at a rate the pressurizer heaters can not keep up with.

3.0 PRECAUTIONS AND LIMITATIONS (Continued)

2. Rapidly decreasing pressurizer level: This action may result in a mismatch between the output of the pressurizer heaters and the volume of liquid available to absorb the energy.

NOTE The liquid space temperature sensor is located approximately three feet above the surge line thermal sleeve to give indication of thermal cycling of the sleeve. This location is approximately one-third up the length of the pressurizer immersion heaters.

C. Changes in pressurizer level may result in rapid changes in pressurizer liquid temperatures when the RHR system is in operation and a steam bubble has been pulled in the pressurizer.

D. Pressurizer vapor temperature will be equal to the saturation temperature at a given pressurizer pressure. Hence changes in vapor temperature indicate a corresponding change in pressurizer pressure.

E. High pressurizer spray line ΔTs may result from rapid cooldown/depressurization of secondary side, or operation of auxiliary pressurizer spray, or operation with RHR controlling RCS temperature and a steam bubble in pressurizer at saturated temperature.

F. An additional unit operator may be required to ensure applicable requirements are satisfied during heatup or cooldown that result in mode changes.

G. During operation in cold shutdown, a steam bubble shall NOT be pulled in the pressurizer unless chemistry specifications (dissolved oxygen or hydrazine) in the Reactor Coolant System are within applicable limits.

H. Measured temperature changes during cooldown will generally be negative. When comparing these values to PTLR or calculated limits, only the absolute magnitudes are to be considered.

I. The use of pressurizer auxiliary spray should trigger the performance of this procedure especially in mode 5 with a pressurizer steam bubble and in mode 4.

3.0 PRECAUTIONS AND LIMITATIONS (Continued)

Unit 1

J. Termination of this procedure should consider plant conditions approaching acceptance criteria such as pressurizer spray line delta T and pressurizer surge line delta T (high limit: 320° F and pressurizer surge line delta T (low limit: 250° F).

K. Limiting the pressurizer heatup rate to less than or equal to 50°F per hour when pressurizer pressure is between 1500 and 2300 psig will reduce pressurizer safety valve leakage.

L. If data taking is being performed using the ICS and the computer system becomes inoperable, then manual data taking in accordance with data sheets has to be performed and evaluated until the required data is completed for the pressure-temperature transient.

M. If applicable, contact the Corporate Computer Engineering Group to notify them of changes made to this procedure via the SPP-2.6 Software Service Request form.

4.0 PREREQUISITE ACTIONS

NOTE 1 During the performance of this Instruction, any **"IF-THEN"** statement may be marked **N/A** when the corresponding stated condition does not occur.

NOTE 2 The appropriate unit, 1 or 2, for which this instruction is being performed should be entered on the top of each page.

4.1 Preliminary Actions

[1] **RECORD** the following information on Surveillance Task Sheet:

A. Unit and operational mode

B. Printed name, signature, and initials of test participants

/ K

4.1 Preliminary Actions (Continued)

Unit 1

[2] **OBTAIN** a copy of the applicable unit's heatup or hydrostatic leak test curve (PTLR Figure 2-1) and/or cooldown curve (PTLR Figure 2-2), AND

LIST the applicable figure: ________ N/A

[3] **ENSURE** NO clearances or system off normal configurations exist which would prevent completion of test performance.

N/A ________ / ________
Test Director Date

[4] IF a configuration or clearance prevents test performance **THEN**

NOTIFY Unit SRO and Supervisor

N/A ________ / ________ / ________
Test Director Date Time

4.2 Measuring and Test Equipment, Parts, and Supplies

None

4.3 Field Preparations

None

4.4 Approvals and Notifications

None

5.0 ACCEPTANCE CRITERIA

A. The RCS temperature and pressure (not including the pressurizer) shall be determined to be within the limit line and applicable rates shown in PTLR Figures 2-1 and 2-2 at least once per 30 minutes during heatup, cooldown and inservice hydrostatic leak testing.

B. A maximum RCS heatup of 100°F and cooldown of 100°F shall NOT be exceeded in ANY one hour period, and a maximum temperature change of 5°F shall NOT be exceeded in ANY one hour period during inservice leak and hydrostatic testing operations **ABOVE** the heatup and cooldown limit curves shown in PTLR Figures 2-1 and 2-2.

C. If either criterion (A) or (B) is NOT satisfied, the SRO must be notified and the action requirement of LCO 3.4.9.1 satisfied.

D. The pressurizer heatup shall be limited to 100°F in ANY one hour period, the pressurizer cooldown shall be limited to 200°F in ANY one hour period, and the spray water differential temperature shall be limited to less than or equal to 560°F. These temperatures shall be determined to be within limits at least once per 30 minutes during a pressurizer heatup or cooldown. If these limits are NOT satisfied, the SRO must be notified and the action requirement of TRM LCO 3.4.9.2 satisfied.

E. Any occurrence of pressurizer spray operation and/or surge line with a differential temperature greater than 320°F shall be reported to the SRO as soon as practical.

F. The lowest RCS operating loop temperature (T_{Avg}) shall be determined to be greater than or equal to 541°F within 15 minutes before criticality. In addition, if the T_{Avg}-T_{Ref} deviation alarm has NOT been reset, T_{Avg} should be determined to be greater than 541°F every 30 minutes while T_{Avg} is less than 551°F. If these criteria are NOT satisfied, the SRO must be notified and the action requirements of LCO 3.1.1.4 satisfied.

Unit 1

6.0 PERFORMANCE

The performance section is organized into five separate sections (or modules). Each section corresponds to one of the plant conditions that initiated performance of this Instruction. The performance data package needs to contain only the section which corresponds to that plant condition. A list of the different sections and their respective purpose is shown below.

Section	Purpose	
N/A 6.1	This section is performed during unit heatup.	TS SR 4.4.9.1.1 TRM SR 4.4.9.2.1 TRM SR 4.4.9.2.2
N/A 6.2	This section is performed during unit cooldown.	TS SR 4.4.9.1.1 TRM SR 4.4.9.2.1 TRM SR 4.4.9.2.2
N/A 6.3	This section is performed during inservice hydrostatic and leak testing operations **ABOVE** the heatup and cooldown limit curves.	TS SR 4.4.9.1.1
N/A 6.4	This section is performed to ensure minimum RCS temperature (T_{Avg}) 15 minutes prior to criticality	TS SR 4.1.1.4.a
6.5	This section is performed to ensure minimum RCS temperature (T_{Avg}) when the RCS is critical and T_{Avg} is less than 551°F with the T_{Avg}-T_{Ref} deviation alarm not reset	TS SR 4.1.1.4.b

APPENDIX E

Page 1 of 1

Unit 1

Sheet 1 of ___

Date Today

MINIMUM TEMPERATURE FOR CRITICALITY

Acceptance Criteria Failure Actions: Action 1 - **IF** Acceptance Criteria is not Satisfied, **THEN** [a] **NOTIFY** SRO, [b] **REFER** to LCO 3.1.1.4.

[1]	Reason for Test:	Prior to Criticality N/A ☐				T_{Avg} minus T_{Ref} Deviation Alarm NOT Reset & T_{Avg} less than 551°F ☑				
▨	▨	Time (15 minute prior to Criticality tracking or 30 minute (T_{Avg} minus T_{Ref}) Deviation Alarm NOT Reset intervals)								
[2]	Time (24 hour clock)									
[3]	RCS Lowest T_{Avg} Temp.(°F) & Instrument/Computer Point (*)__________ (Reference Appendix F)									
[4]	RCS Next Lowest T_{Avg} Temp.(°F) & Instrument/Computer Point (*)__________ (Reference Appendix F)									
[5]	Acceptance Criteria RCS T_{Avg} for [3] and [4] are greater than or equal to 541°F within 15 minutes of criticality. IF NO, THEN REFER to Action 1	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
[6]	Criticality Achieved or (T_{Avg} minus T_{Ref}) Deviation Alarm Reset?	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No
▨	Initials									

[1] **RECORD** reason for this performance.

PERFORM the following sequence every 15 minutes to document prior to criticality temperature tracking or every 30 minutes until (t_{avg} minus t_{ref}) deviation alarm is reset:

[2] **RECORD** current time (24 hour clock).

[3] **RECORD** instrument (Ref. Appendix F) selected for lowest RCS temperature (T_{Avg}) tracking (*) AND **RECORD** current RCS temperature to nearest whole number.

[4] **RECORD** instrument (Ref. Appendix F) selected for next lowest RCS (T_{Avg}) tracking (*) AND **RECORD** current next lowest RCS temperature to nearest whole number.

[5] **VERIFY** RCS T_{Avg} is Acceptable by checkoff in row [5].

[6] **RECORD** whether Criticality is achieved or whether (T_{Avg} minus T_{Ref}) Deviation Alarm is Reset by checkoff in row [6] AND **RECORD** Date & Time when accomplished.

Use additional sheets as required. (*)-Additional Instrument ID recording needs entering only when changed within test progress.

APPENDIX F

Page 1 of 1

INSTRUMENT ID'S AND COMPUTER POINTS

RCS Temperature Instruments and Computer Points For Monitoring:

<table>
<tr><td colspan="6"></td></tr>
<tr><td colspan="3">RCPs Running (RTDs Avail.)</td><td colspan="3">RCPs NOT Running/RHR in Service</td></tr>
<tr><td>RCS Loop</td><td>Temperature Instrument</td><td>Plant Computer Point</td><td>RHR Train</td><td>Temperature Instrument</td><td>Plant Computer Point</td></tr>
<tr><td>1</td><td>TR–68–1 P001</td><td>T0419A</td><td>A</td><td>TR–74–14 P001</td><td>T0630A</td></tr>
<tr><td>2</td><td>TR–68–24 P001</td><td>T0439A</td><td>B</td><td>TR–74–25 P001</td><td>T0631A</td></tr>
<tr><td>3</td><td>TR–68–43 P001</td><td>T0459A</td><td colspan="3">RCPs NOT Running/RHR not in Service</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">TR–68–65 P001</td><td rowspan="2">T0479A</td><td>RCS Loop</td><td>Temperature Instrument</td><td>Plant Computer Point</td></tr>
<tr></tr>
<tr><td colspan="3">RCPs Running (RTDs NOT Avail.)</td><td>1</td><td>TR–68–1 P002</td><td>T0406A</td></tr>
<tr><td>1</td><td>TI-68-1C</td><td>N/A</td><td>2</td><td>TR–68–24 P002</td><td>T0426A</td></tr>
<tr><td>2</td><td>TI-68-24C</td><td>N/A</td><td>3</td><td>TR–68–43 P002</td><td>T0446A</td></tr>
<tr><td>3</td><td>TI-68-43C</td><td>N/A</td><td>4</td><td>TR–68–65 P002</td><td>T0466A</td></tr>
<tr><td>4</td><td>TI-68-65C</td><td>N/A</td><td colspan="3">NOTE:
The temperature indication chosen for monitoring RCS temperature must be selected in the following sequence to correspond to a RCS loop with a running RCP. If RCPs are running and HL RTDs are available, then use the HL RTDs. If no RTDs are available in a loop with a running RCP, hot leg thermocouples must be used. If no RCPs are running and RHR is in service, the RCS temperature should be monitored using RHR HX inlet temperature. If RHR is not is service, then use T-cold RTDs.</td></tr>
</table>

RCS Pressure Instruments And Computer Points

Pressure Instrument	Plant Computer Point ID
P-68-68	P0499A
PI-68-66	N/A
P-68-66A	P0129A
PR-68-69	N/A

Pressurizer Spray Line Temperature Instruments and Computer Points

Source of Pzr Spray	Temperature Instrument	Plant Computer Point ID
Loop 1	TI-68-317	T0484A
Loop 2	TI-68-316	T0483A
Aux Spray	TI-62–87	T0126A

RCS T_{avg} Temperature Instruments and Computer Points

RCS Loop	Temperature Instrument	Plant Computer Point ID
1	TI-68-2E	T0400A
2	TI-68-25E	T0420A
3	TI-68-44E	T0440A
4	TI-68-67E	T0460A

Note: Analog points are notated on this appendix. Computer points derived from these analog points are acceptable for use by the plant computer.

APPENDIX E

Page 1 of 1

Unit_______ Sheet___ of ___ Date_________

MINIMUM TEMPERATURE FOR CRITICALITY

Acceptance Criteria Failure Actions: Action 1 - **IF** Acceptance Criteria is not Satisfied, **THEN** [a] **NOTIFY** SRO, [b] **REFER** to LCO 3.1.1.4.

[1]	**Reason for Test:**	**Prior to Criticality** ☐				**T_{Avg} minus T_{Ref} Deviation Alarm NOT Reset & T_{Avg} less than 551°F** ☐				
		Time (15 minute prior to Criticality tracking or 30 minute (T_{Avg} minus T_{Ref}) Deviation Alarm NOT Reset intervals)								
[2]	**Time (24 hour clock)**									
[3]	**RCS Lowest T_{Avg} Temp.(°F) & Instrument/Computer Point (*)__________ (Reference Appendix F)**									
[4]	**RCS Next Lowest T_{Avg} Temp.(°F) & Instrument/Computer Point (*)__________ (Reference Appendix F)**									
[5]	**<u>Acceptance Criteria</u> RCS T_{Avg} for [3] and [4] are greater than or equal to 541°F within 15 minutes of criticality. IF NO, THEN REFER to Action 1**	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
[6]	**Criticality Achieved or (T_{Avg} minus T_{Ref}) Deviation Alarm Reset?**	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No	☐ Yes Time: Date: ☐ No
	Initials									

[1] **RECORD** reason for this performance.

PERFORM the following sequence every 15 minutes to document prior to criticality temperature tracking or every 30 minutes until (t_{avg} minus t_{ref}) deviation alarm is reset:

[2] **RECORD** current time (24 hour clock).
[3] **RECORD** instrument (Ref. Appendix F) selected for lowest RCS temperature ($T_{Avg)}$ tracking (*) AND **RECORD** current RCS temperature to nearest whole number.
[4] **RECORD** instrument (Ref. Appendix F) selected for next lowest RCS (T_{Avg}) tracking (*) AND **RECORD** current next lowest RCS temperature to nearest whole number.
[5] **VERIFY** RCS T_{Avg} is Acceptable by checkoff in row [5].
[6] **RECORD** whether Criticality is achieved or whether (T_{Avg} minus T_{Ref}) Deviation Alarm is Reset by checkoff in row [6] AND **RECORD** Date & Time when accomplished.

Use additional sheets as required. (*)-Additional Instrument ID recording needs entering only when changed within test progress.

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Event Description: Raise plant power to 13-15% RTP

Time	Position	Applicant's Actions or Behavior
Simulator Operator: No action required for event 1		
Indications Available: None Applicable		
T = 0	**Crew will perform power change IAW 0-GO-4, Section 5.2 Reactor Power Ascension To Between 13% And 15% RTP**	
	SRO	Direct a load increase in accordance with 0-GO-4, Reactor Power Ascension To Between 13% And 15% RTP, Section 5.2, and 0-SO-62-7 Boron Concentration Control, Section 6.1 or Section 6.2.
	NOTES: 1. 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. 2. Recommended dilution rate is 50 to 75 gallon batches every 12 to 15 minutes for a steady power increase. Rod movement should be limited to 1/2 step increments approximately every 1 1/2 minutes. Dilution and rod movement rates may be adjusted depending on SG level control stability. 3. Control Rod withdrawal and / or dilution requirements may be significantly impacted by the change in core reactivity due to changing Xenon concentration.	
	CREW	**INITIATE** a methodical and deliberate reactor power increase by manual adjustment of the control banks or by diluting the RCS.
	CREW	**WHEN** reactor power is above 5%, **THEN LOG** Mode 1 entry in the Unit Narrative Log.
	CRO	**MAINTAIN** the SG levels on program by periodically adjusting the feedwater bypass reg controller level setpoints using Appendix B and C.
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 ≥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.	

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Event Description:	Raise plant power to 13-15% RTP							

Time	Position	Applicant's Actions or Behavior
Evaluator Note: Dilutions will be performed based on the RE-provided Reactivity Spreadsheet; based on 0-GO-4 Notes, recommended dilution rate is 50 to 75 gallon batches every 12 to 15 minutes for a steady power increase. During subsequent power escalation, large volume dilutions will be divided evenly over each hour as determined by the crew [i.e.: one-third, one-quarter of the volume over each hour's period (e.g.: ~240 gallons, 4 times per hour for 963 gallons for the first hour)].		
	RO	[1] **ENSURE** unit is <u>NOT</u> in a Tech Spec or TRM action that prohibits positive reactivity additions. **[C.1]**
	NOTE:	HUT level increase of 1% is equal to 1380 gallons (TI-28 fig. 34).
	RO	[2] **ENSURE** sufficient capacity available in the HUT selected to receive expected amounts of CVCS letdown: (**N/A** if <u>not</u> used)
		HUT A — LEVEL ________ % — INITIALS ________ HUT B — LEVEL ________ % — INITIALS ________
	RO	[3] **ENSURE** makeup system is aligned for **AUTO** operation in accordance with Section 5.1.
	RO	[4] **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.
	RO	[5] **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	[6] **PLACE** **[<u>HS-62-140A</u>]**, Boric Acid Supply to Blender Flow Control Switch to the **STOP** position.
	RO	[7] **PLACE** **[<u>HS-62-140B</u>]**, CVCS Makeup Selector Switch to the **DILUTE** position.

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Event Description:	Raise plant power to 13-15% RTP						

Time	Position	Applicant's Actions or Behavior
	RO	**[8] ENSURE [HS-62-140D]**, Boric Acid Valve to the Blender is **CLOSED** (Green light is **LIT**).
	RO	**[9] SET [FQ-62-142]**, Batch Integrator for the desired quantity
	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	**[10] ADJUST [FC-62-142]**, Primary Makeup Water Flow Controller for the desired flow rate
	RO	**[11] PLACE [HS-62-140A]**, Boric Acid Supply to Blender Flow Control Switch to the **START** position.
	RO	**[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]**.
	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	**[13] IF** primary water addition to the bottom of the VCT **[FCV-62-144]** is desired, **THEN**
	RO	**[a] CLOSE [FCV-62-128]** with **[HS-62-128]**.
	RO	**[b] OPEN [FCV-62-144]** with **[HS-62-144]**.
	RO	**[c] VERIFY** Primary Water flow by **[FI-62-142A] OR [FQ-62-142]**.
	NOTE	It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.
		[14] MONITOR nuclear instrumentation and reactor coolant temperature to ensure the proper response from dilution.

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Event Description:	Raise plant power to 13-15% RTP						

Time	Position	Applicant's Actions or Behavior
		[15] **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.
		[16] **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]**.
		[c] **VERIFY** no primary water flow on either **[FI-62-142A] OR [FQ-62-142]**.
		[d] **ENSURE [FCV-62-128]** is **CLOSED**
		[17] **IF** power increase in progress and additional dilutions will be required, **THEN** use this table to re-perform steps **[4]** through **[18]** (next page)
		[19] **REALIGN** the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1.
		[20] **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.
		[21] **IF** RCS boron sample is required, **THEN NOTIFY** Chem Lab to obtain RCS boron sample.

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Event Description: Raise plant power to 13-15% RTP

Time	Position	Applicant's Actions or Behavior	
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. ______/______ 1st CV			
[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 plant power to 13-15% RTP						

Time	Position	Applicant's Actions or behavior
0-SO-85-1, Control Rod Drive System, Section 6.4, Transferring from Manual to Auto Rod Control; & Section 6.5, Transferring from Auto to Manual Rod Control		
Evaluator Note:		As stated in each section's procedural Step 1 Note 1, the operators will use a laminated copy of Sections 6.4 & 6.5 available on the book desk under the glass at 1-M-4. It is verified as current, in-effect revision routinely to assure currency.
	NOTE 1:	A laminated copy of this section can be maintained in the Unit Control Room for repetitive use for routine rod manipulations.
	NOTE 2:	Defeating or restoring Tavg/Delta T or NIS channel may cause step change in input to rod control. A delay of at least 3 minutes prior to returning rod control to automatic will allow lead/lag signal to decay off.
	NOTE 3:	This Section may be N/A if Rod Control is being returned to AUTO in response to a transient (runback) condition.
	RO	[1] **ENSURE** turbine power is greater than 15 percent.
	RO	[2] **ENSURE** Window 31 (E-3), LOW TURB IMPULSE PRESS ROD WITHDRAWAL BLOCKED C-5, Permissive light on panel **[XA-55-4A]** is **NOT LIT**.
	RO	[3] **ENSURE** less than 1 degree Tavg/Tref mismatch.
	RO	[4] **PLACE [HS-85-5110]**, Rod Control Mode Selector in the **AUTO** position.
	RO	[5] **VERIFY** Rod Speed Indicator **[SI-412]**, indicates 8 Steps/minute.
		End of Section 6.4
		Section 6.5, Transferring from Auto to Manual Rod Control
	NOTE 1:	A laminated copy of this section can be maintained in the Unit Control Room for repetitive use for routine rod manipulations.
	NOTE 2:	Manual rod withdrawal is inhibited by any of the following signals: A. C-1, High Flux Intermediate Range Monitor B. C-2, High Flux Power Range Monitor C. C-3, Overtemperature Delta-T D. D. C-4, Overpower Delta-T

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Event Description: Raise plant power to 13-15% RTP

Time	Position	Applicant's Actions or behavior
		0-SO-85-1, Control Rod Drive System, Section 6.4, Transferring from Manual to Auto Rod Control; & Section 6.5, Transferring from Auto to Manual Rod Control
	RO	[1] **PLACE [HS-85-5110]**, Rod Control Mode Selector in the **MANUAL** position.
	RO	[2] **VERIFY** Rod Speed Indicator **[SI-412]**, indicates 48 Steps/minute.
	RO	[3] **IF** control rod movement is required, **THEN ADJUST** position using **[HS-85-5111]**, Rod Control Switch.
	RO	[4] **IF** it is desired to leave **[HS-85-5110]**, Rod Control Mode Selector in Manual for an extended period of time, **THEN** **PLACE** this Section in the Active Procedures Book.
	RO	[5] **WHEN** it is desired to place **[HS-85-5110]**, Rod Control Mode Selector to Automatic, **THEN** **GO TO** Section 6.4.
		End of Section 6.5

Op Test No.:	NRC 2010302	Scenario #	3	Event #	1	Page	8 of 88
Event Description:	Raise plant power to 13-15% RTP						

Time	Position	Applicant's Actions or Behavior
	0-GO-4, Section 5.2 Reactor Power Ascension To Between 13% And 15% RTP	
	NOTE: The steam generator level operator is in control of unit startup until the main feedwater reg valves are in **AUTO**. **[C.5]**	
	SRO	[1] **REVIEW** plant parameters and indications, **AND** **VERIFY** stability prior to reactor power escalation.
	NOTES: 1) Adjusting blowdown flow will provide an additional method of controlling SG water inventory. (Close blowdown isolation valves only if level cannot be maintained) 2) Prior to increasing reactor power above 5%, SG blowdown should be in service. 3) Maximum blowdown rate is less than or equal to 270 gpm. Each steam generator flow, up to 60 gpm is indicated on panel L-357 located in the A.B. Supply Fan Rm. Minimum blowdown rate equals 5 gpm for each steam generator. Final blowdown rate should be determined by chemical analysis. 4) Computer points require a prefix 0, 1, or 2 be placed in front of the point number; for example, 1F2261A.	
	BOP	[2] **IF** SG blowdown is in service, **THEN ADJUST** FIC-15-43 as desired. (plant computer pt. F2261A)
	NOTES: 1) 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. 2) Recommended dilution rate is 50 to 75 gallon batches every 12 to 15 minutes for a steady power increase. Rod movement should be limited to 1/2 step increments approximately every 1 1/2 minutes. Dilution and rod movement rates may be adjusted depending on SG level control stability. 3) Control Rod withdrawal and/or dilution requirements may be significantly impacted by the change in core reactivity due to changing Xenon concentration.	

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Event Description: Raise plant power to 13-15% RTP

Time	Position	Applicant's Actions or Behavior
	RO	[3] **INITIATE** a methodical and deliberate reactor power increase by manual adjustment of the control banks or by diluting the RCS. RO initiates a control rod withdrawal according to the Reactivity Plan
Evaluator Note:		Crew will coordinate control rod withdrawal and dilutions based on the RE-provided Reactivity Spreadsheet and would coordinate rod withdrawal and dilutions observing the guidance the Step 3 NOTES above.
		MODE 1
Evaluator Note:		Mode change call is made using Loop ΔT indications on the MCB and ICS, not NIs; NIs may be referred to during the MODE change determination Refer to 0-GO-4 Section 3.1, Precaution C, specifically bullets 2 & 3 (below): • 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).
	RO	[4] **WHEN** reactor power is above 5%, **THEN LOG** Mode 1 entry in the Unit Narrative Log.
	SRO	RO would be monitoring this; any crew member may make the initial identification however the SRO should announce transition to MODE 1 based on Loop ΔT indication. Normally, both MCB and ICS indications are reviewed for MODE transition verification. Crew member replaces the MODE 2 sign with MODE 1 sign on 1-M-4 under the clock.
	BOP	[5] **UNIT 1 ONLY:** **MAINTAIN** the SG levels on program by periodically adjusting the feedwater bypass reg controller level setpoints using Appendix B and C. BOP refers to appendices noted (included following this event guide) and maintains SG levels and program setpoints during the power increase.
		[6] **UNIT 2 ONLY:...N/A**

Op Test No.:	NRC 2010302	Scenario #	3	Event #	1	Page	10	of 88
Event Description:	Raise plant power to 13-15% RTP							

Time	Position	Applicant's Actions or Behavior
Evaluator Note:	According to turnover information, the crew will not prepare for nor perform MT roll; Step 6 is N/A for this exam.	
	N/A	[7] **IF** Turbine Roll in parallel with power increase is desired, **THEN PERFORM** Section 5.3 in parallel with the remainder of this section.
	RO	[8] **IF** the intermediate range rod stop setpoint is reached before P-10 energizes, **THEN**
		[8.1] **STOP** the power escalation.
		[8.2] **CONTACT** Reactor Engineering to evaluate power range calibration. **[C.3]**
	BOP	[9] **WHEN** reactor power is greater than or equal to 10% on at least 2 out of 4 PRMs, **THEN [C.1] [C.3]**
		[9.1] **VERIFY** annunciator XA-55-4A, window D-5:
		P-10 NUCLEAR AT POWER PERMISSIVE is LIT.
	BOP	[9.2] **VERIFY** annunciator XA-55-4A, window B-5:
		P-7 LOW POWER TRIP BLOCK is DARK.
	RO	[9.3] **COMPARE** the highest reading PRM with the highest reading loop ΔT indication to be within 5% of each other. **[C.1] [C.3]**
	RO	[9.4] **IF** the above conditional response is **NOT** attained, **THEN**
		A. **STOP** the power increase. ☐ B. **NOTIFY** the SRO. Initials Time Date

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Event Description: Raise plant power to 13-15% RTP

Time	Position	Applicant's Actions or Behavior
	NOTE:	The following step will block both IR (25%) and PR (25%) low power reactor trips.
	RO	[10] **BLOCK** the IR HI FLUX reactor trip and PR LO Range HI FLUX reactor trip by performing the following:
	RO	[10.1] **PLACE** IRM TRIP BLOCK P-10 **[HS-92-5003] AND [HS-92-5004]** to **BLOCK**.
	BOP	[10.2] **VERIFY** annunciator XA-55-4A, window C-2:
		INTERMED RANGE TRAINS A & B TRIP BLOCKED is LIT.
	RO	[10.3] **RELEASE [HS-92-5003] AND [HS-92-5004]**. [10.4] **PLACE** PRM LOW POWER TRIP BLOCK P-10 **[HS-92-5005] AND [HS-92-5006]** to **BLOCK**.
	BOP	[10.5] **VERIFY** annunciator XA-55-4A, window D-1:
		POWER RANGE LOW SETPOINT TRAINS A & B TRIP BLOCKED is LIT.
		[10.6] **RELEASE [HS-92-5005] AND [HS-92-5006]**.
		Step 11 **NOTES: U2 Applicable Only**
	CREW	[11] **WHEN** reactor power is between 13 and 15%, **THEN**
		[11.1] **STOP** power increase.
		[11.2] **STABILIZE** the plant.
		[11.3] **UNIT 2 ONLY:...**
	SRO	[12] **IF** rolling of second MFWP... **This step N/A**

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Event Description:	Raise plant power to 13-15% RTP						

Time	Position	Applicant's Actions or Behavior
	SRO	[13] **IF** unit shutdown is required… **This step N/A**
	SRO	[14] **ENSURE** steps 5.2[1] through 5.2[11] of this section complete. (applicable steps)
		NOTE If Section 5.3 has already been initiated, then performance should continue at the step in effect.
	SRO	[15] **IF** rolling the turbine, **THEN** **GO TO** Section 5.3.
		END OF TEXT

Lead examiner may cue the next event after CREW has entered MODE 1

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Event Description:	Raise plant power to 13-15% RTP								

Appendix B
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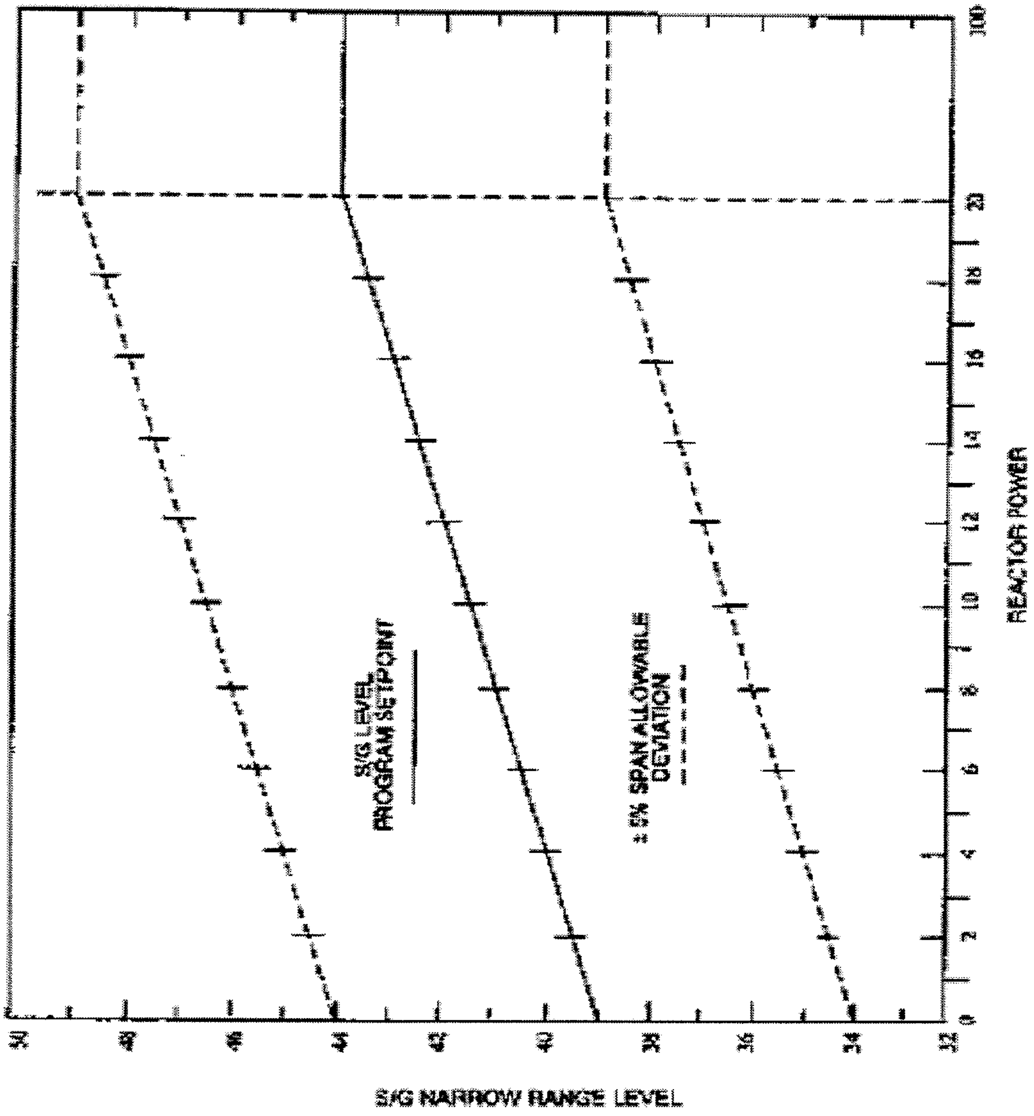
FIGURE 1 STEAM GENERATOR LEVEL SETPOINT VS REACTOR POWER

NOTE

This figure does **NOT** represent the automatic S/G level program. The operating band provides a guide for Operators during Unit start-up and is intended to enhance S/G level control during transition from AFW level control to Bypass Reg valve control to Main Reg Valve control.



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Event Description: Raise plant power to 13-15% RTP

STARTUP________ **Unit** _____ **Date** ________

Appendix C
(Page 1 of 5)

MFW REG AND MFW BYPASS VALVE INSTRUCTIONS

1.0 MFW BYPASS CONTROLLER LEVEL SETPOINT ADJUSTMENTS

CAUTION

It is VERY important that adjustments to MFW Reg valves are made SLOWLY with the operator observing indicators to verify the desired results. This point cannot be over stressed as it is a key point to a successful startup.

NOTES

1) The SG MFW Bypass controller should be adjusted on only <u>ONE</u> SG at a time. [C.5]

2) The MFW Bypass controller should be in MANUAL prior to adjusting setpoint value to prevent controller gain input change.

[1] **WHEN** MFW Bypass controller level setpoint requires adjustment, **THEN**

PERFORM the following steps on one MFW Bypass valve at a time: [C.5] (**N/A** valves <u>**NOT**</u> adjusted)

[1.1] **REFER TO** Appendix B for allowable setpoint.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.2] **PLACE** MFW Bypass controller in **MANUAL**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

NOTE

Allow sufficient time for the MFW Bypass to respond.

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Event Description: Raise plant power to 13-15% RTP

[1.3] **STABILIZE** SG level at a desired level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.4] **ADJUST** controller setpoint in small increments while monitoring SG level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.5] **PLACE** MFW Bypass controller in **AUTO**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.6] **ALLOW** the plant to stabilize before adjusting another valve setpoint.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

2.0 DAMPENING SG LEVEL OSCILLATIONS WITH MFW BYPASS VALVES IN SERVICE

NOTES

1) Perform adjustments to one SG at a time. <u>Allow Plant Parameters to Stabilize</u> between valve adjustments. [C.5]
2) The wide range level recorders may respond to a change in level before the narrow range indicators. [C.5]
3) Indicated flowrate on the feed flow indicators may **<u>NOT</u>** reflect an accurate value of flow. The flow indication is to be used as a <u>reference value only</u>. [C.5]
4) The following step may be performed any time SG level oscillates outside the SG level setpoint operating band of ±5 percent.

[1] **IF** required to dampen SG level oscillations at any time during SG level control with the MFW bypass controllers in **AUTO**, **THEN**

PERFORM the following: [C.5]

Op Test No.:	NRC 2010302	Scenario #	3	Event #	1	Page	16	of	88
Event Description:	Raise plant power to 13-15% RTP								

[1.1] **PLACE** the MFW Bypass controller in **MANUAL**. ☐

[1.2] **CHANGE** valve demand position LESS THAN 10 percent in the opposite direction of valve travel. ☐

[1.3] **PLACE** the MFW Bypass controller in **AUTO**. ☐

3.0 POSITIONING MFW REG VALVES OFF SEAT DURING UNIT STARTUP

NOTES

1) After a MFW Reg is adjusted DO **NOT** increase reactor power or open MFW Reg further until plant stabilizes and SG level returns to program. ALLOWING PLANT PARAMETERS TO STABILIZE BETWEEN REG VALVE ADJUSTMENTS IS THE KEY TO SMOOTH POWER ASCENSION.

2) Anticipate level shrink when the MFW Reg comes off its seat. [C.5]

3) Use main feedwater flow indication to determine when MFW Reg valves come off seat.

[1] **PERFORM** the following steps to position MFW Reg valves off seat:

[1.1] **REVIEW** plant parameters and indications prior to initial opening.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.2] **OPEN** the MFW Reg valve in small increments while maintaining the MFW Bypass valve between 25 and 60 percent open.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.3] **ENSURE** MFW Bypass valve starts closing when MFW Reg valve is opened.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

Op Test No.: NRC 2010302 Scenario # 3 Event # 1 Page 17 of 88

Event Description: Raise plant power to 13-15% RTP

[1.4] **ENSURE** SG level returns to MFW Bypass controller setpoint when MFW Reg valve is adjusted.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.5] **ENSURE** SG level and MFW system stabilizes before performing subsequent valve adjustments.

SG-1 SG-2 SG-3 SG-4

3.0 POSITIONING MFW REG VALVES OFF SEAT DURING UNIT STARTUP (continued)

☐ ☐ ☐ ☐

4.0 PLACING MFW REG VALVES IN AUTOMATIC

CAUTIONS

1) **DO NOT place a MFW Reg valve in AUTO without sufficient flow being indicated on the controlling steam/feed flow indicators.**

2) **Both MFW Reg and MFW Bypass controllers should NOT be left in AUTO simultaneously for an extended period.** [C.5].

[1] **WHEN** desired to place MFW Reg valves in **AUTO, THEN PERFORM** the following:

[1.1] **ADJUST** SG level to SG program level setpoint, and **ADJUST** the MFW Reg valve to obtain near zero deviation (between -5 percent and +5 percent) while matching steam and feed flows.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.2] **WHEN** controller deviation is near zero, **THEN**

PLACE the MFW Reg valve in **AUTO**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

Op Test No.: NRC 2010302 Scenario # 3 Event # 1 Page 18 of 88

Event Description: Raise plant power to 13-15% RTP

[1.3] **VERIFY** the MFW Reg valve is controlling SG level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.4] **PLACE** the associated MFW Bypass valve in **MANUAL**.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.5] **CLOSE** the MFW Bypass valve in small increments, **AND**

ENSURE the MFW Reg valve responds to control SG level.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[1.6] **WHEN** MFW Reg valve is controlling SG level, **THEN**

PROCEED TO another SG loop.

SG-1	SG-2	SG-3	SG-4
☐	☐	☐	☐

[End of Appendix]

Op Test No.:	NRC 2010302	Scenario #	3	Event #	2	Page	19 of 88

Event Description: Intermediate Range channel N-35 failure low (>5% RTP at initiation)

Time	Position	Applicant's Action or Behaviors

Simulator Operator: at Lead Examiner direction, insert Event 2

Indications/Alarms

Indications

1-M-4

- **1-XI-92-5003A IRM % POWER N-35 indicator fails downscale to minimum.**
- **1-XI-92-5011C, IRM-STARTUP RATE N-35 indicator trends down then stabilizes at '0'.**
- **1-XR-92-5001, NUCLEAR POWER NR-45 Recorder selected trace goes to '0'**

1-M-13

- **1-XI-92-5003B NEUTRON FLUX INTERMEDIATE RANGE indicator fails to '0'.**

Time	Position	Applicant's Action or Behaviors
T = 20	Crew	Respond to MCR indications; no alarms associated with this failure; N-35 failure will be identified by operator control board monitoring.
		AOP-I-01, Section 2.0 OPERATOR ACTIONS

1. **DIAGNOSE** the failure:

IF...	GO TO SECTION	PAGE
Source Range Failure	2.1	4
Intermediate Range Failure	2.2	9
Power Range Failure	2.3	14

Time	Position	Applicant's Action or Behaviors
	SRO	US may use AOP-I.01,Nuclear Instrument Malfunction Section 2.2, Intermediate Range Failure:
	SRO	May request a new reactivity spreadsheet to level power/maintain MODE 1 conditions while this instrument malfunction is addressed.

CAUTION 1 **If reactor power is below P-6 (10^{-4} %), Tech Specs require restoring inoperable channel prior to raising power above P-6.**

CAUTION 2 **If reactor power is above P-6 but below 5% power, Tech Specs require restoring inoperable channel prior to raising power above 5%.**

NOTE 1 If Intermediate Range channel is failed high, reducing reactor power to less than P-10 (10%) will result in a reactor trip. If control power is available, this condition will be corrected when the channel is bypassed in Step 6.

NOTE 2 If any IR channel has failed high, then automatic re-enabling of Source Range indication may be disabled. (SRMs may require manual reinstating in ES-0.1.)

NOTE 3 Failure of Intermediate Range Channel may affect associated Source Range Channel.

Op Test No.: NRC 2010302 Scenario # 3 Event # 2 Page 20 of 88

Event Description: Intermediate Range channel N-35 failure low (>5% RTP at initiation)

Time	Position	Applicant's Action or Behaviors
	RO	1. **IF** unit is in Mode 2,**THEN STABILIZE** reactor power at current level.
	SRO	2. **EVALUATE** the following Tech Specs for applicability: • 3.3.1.1 (3.3.1), Reactor Trip System Instrumentation - Actions 3c & d, (From Table 3.3-1 functional unit 5) Applies – Above 5% & 10%of RATED THERMAL POWER, POWER OPERATION may continue; TS 3.0.3. is N/A AND • 3.3.3.7, Accident Monitoring Instrumentation Action 1 (From Table 3.3-10 Instrument 17) Applies - within 30 days, return the affected instrument or Ht Stby w/i 6 hrs. & Ht SD w/i following 6 hrs.
Evaluator Note: TSs 3.3.3.5 and 3.9.2 would not be applicable with this failure since the associated Source Range is not affected.		
	RO	3. **CHECK** at least one Intermediate Range channel OPERABLE. RO should indicate N36 is reading accurately and also re-select or indicate NR-45 Recorder is re-selected to an operating channel.
		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.**
		NOTE: The following table lists Intermediate Range NIS power supplies… **N/A-** RO verifies Instr Pwr and Cont Pwr indicators lit and Instr and Cont Pwr fuses not blown on M-13 N35 drawer.
	RO	4. **CHECK** power available to failed Intermediate Range channel: [M-13] • INSTRUMENT POWER ON indicator LIT **AND** • CONTROL POWER ON indicator LIT

Op Test No.: NRC 2010302 Scenario # 3 Event # 2 Page 21 of 88

Event Description: Intermediate Range channel N-35 failure low (>5% RTP at initiation)

Time	Position	Applicant's Action or Behaviors
	RO	5. **IF** required to monitor IR channel on NR-45 recorder, **THEN ENSURE** OPERABLE IR channel selected on NR-45 Recorder. [M-4]
	RO	6. **PLACE** Level Trip switch for failed channel in BYPASS [M-13, N35/N36].
Lead Evaluator Note:		**Ensure RO performs following actions at NI Panel, M-13.**
	RO	7. **If** control power is available, **THEN PREFORM** the following: a. **VERIFY** NIS TRIP BYPASS annunciator LIT [M-6A, A-1]. b. **VERIFY** appropriate annunciator LIT: 1. INTERMEDIATE RANGE TRIP BYPASS CHANNEL I [M-4A, A-2] OR 2. INTERMEDIATE RANGE TRIP BYPASS CHANNEL II [M-4A, B-2]
	SRO	SRO directs as the RO performs steps 6 - 9:
	RO	8. **CHECK** associated Source Range Channel NOT affected
	SRO	9. **GO TO** appropriate plant procedure.
		END OF SECTION
Evaluator Note:		The following CREW Brief and Notification actions are not contained in the procedure.
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Technical Specifications are identified.

Op Test No.: NRC 2010302 Scenario # 3 Event # 3 Page 22 of 88

Event Description: Q-A ERCW Pump Over current trip w/ BO Sequencer Failure

Simulator Operator: at Lead Examiner direction, insert Event 3

Indications/Alarms

Annunciators:

0-M-27A

0-XA-55-27A A-1: "UNIT 1 HEADER A PRESSURE LOW

C-2: "PUMP Q-A DISCH PRESS LOW

0-M-27B :

- **0-XA-55-27B-A E-4: "ERCW/CCS PUMP MOTOR TRIP"**

Indications

0-M-27A

- **ERCW HDR 1A SUPPLY FLOW 1-FI-67-61: shows decreasing trend (to single pump conditions)**
- **ERCW HDR 1A SUPPLY PRESS, 1-PI-67-493A: shows decreasing trend (to single pump conditions)**
- **ERCW HDR 2A SUPPLY FLOW 2-FI-67-61: shows normal steady trend.**
- **ERCW HDR 2A SUPPLY PRESS, 2-PI-67-493A: shows normal steady trend.**
- **ERCW PUMP Q-A MOTOR AMPS, 0-EI-67-459A: shows '0' amps.**
- **ERCW PUMP Q-A 0-HS-67-460A Handswitch White and Green Indicating Lights are illuminated.**

Time	Position	Applicant's Actions or Behavior
T = 30	CREW	Respond in accordance with Alarm Response Procedures; Refers US to AOP-M.01 as determined in 0-AR-M27-A, C-2; (other ARPs may also apply)
	SRO	US may use AOP-M.01, LOSS OF ESSENTIAL RAW COOLING WATER Section 2.1, ERCW Pump(s) tripped or failed
	BOP	1. **IDENTIFY** and **LOCK OUT** failed ERCW pump.
	BOP	2. **START** additional ERCW pumps as required to maintain supply header pressure between 78 psig and 124 psig.
	BOP	3. **CHECK** two Train A ERCW Pumps AVAILABLE.
	BOP	4. **CHECK** 1A and 2A ERCW supply header pressures and flows NORMAL:
		a. Supply header pressures [between 78 psig and 124 psig]: • 1-PI-67-488A • 2-PI-67-488A

Op Test No.: NRC 2010302 Scenario # 3 Event # 3 Page 23 of 88

Event Description: Q-A ERCW Pump Over current trip w/ BO Sequencer Failure

Time	Position	Applicant's Actions or Behavior
		b. Supply header flows [expected value]: • 1-FI-67-62 [expected value:2500-3000 gpm] • 2-FI-67-62 [expected value:11000-12000 gpm]
	BOP	5. **CHECK** 1B and 2B ERCW supply header pressures and flows NORMAL:
		a. Supply header pressures [between 78 psig and 124 psig]: • 1-PI-67-488A • 2-PI-67-488A b. Supply header flows [expected value]: • 1-FI-67-62 • 2-FI-67-62 **[Similar parameter values to those above]**
	CREW	6. **DISPATCH** personnel to inspect failed pump(s) and determine cause for failure.
	SRO	7. **NOTIFY** STA to evaluate Tech Spec LCO 3.7.4, ERCW System, for both units.
		3.7.4, Essential Raw Cooling Water System • Restore inoperable pump w/i 72 hrs. or Ht Stby w/i next 6 hrs and Cld SD w/i the following 30 hrs. (Action applicable until Transfer Switch 0-XS-67-285, ERCW PUMPS J-A & Q-A DG POWER SEL is re-selected to the OPERABLE pump, in this case the J-A position.
	BOP	8. **CHECK** ERCW pump loading amps NORMAL.
	BOP	9. **TRANSFER** emergency power selector switch away from failed pump.
Evaluator Note:		ERCW Pump Select Sw XS-67-285 is overridden to the 'Q-A position' which simulates BO Sequence failure preventing J-A ERCW Pump automatic start later in this scenario.

Op Test No.:	NRC 2010302	Scenario #	3	Event #	3	Page	24	of 88
Event Description:	Q-A ERCW Pump Over current trip w/ BO Sequencer Failure							

Time	Position	Applicant's Actions or Behavior
	SRO	10. **EVALUATE** need to close and place clearance on manual discharge valve for failed pump.
	SRO	11. **GO TO** appropriate plant procedure.
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 US directs return to appropriate plant procedures.		

Op Test No.: NRC 2010302 Scenario # 3 Event # 4 Page 25 of 88

Event Description: PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure

Time	Position	Applicant's Actions or Behavior

Simulator Operator: at Lead Examiner direction, insert Event 4

Indications/Alarms

Indications

1-M-3:

- **1-SI-46-20A, MFPT 1A Speed Indication decreasing;**
- **1-PI-3-66A, MFP 1A Outlet Pressure indication decreasing;**
- **1-FI-3-70, MFP 1A Outlet Flow indication decreasing**

1-M-4:

- **1-XX-55-4A, Steam Dump Valve Status Panel: all 12 Steam Dump Valves going closed/closed;**
- **LOOPS 1-4 SG-1,2,3,4 STM Flow indicators: 2 Channels per SG (8 total indicators) flow going down;**
- **LOOPS 1-4 SG-1,2,3,4 FW Inlet Flow indicators: 2 Channels per SG (8 total indicators) flow going down;**
- **LOOPS 1-4 SG-1,2,3,4 LEVEL -NR indicators: 3 Channels per SG (12 total indicators) level going down;**
- **1-XI-1-33, Steam Dump Demand Indicator going down**
- **1-PIC-1-33, Steam Dump Pressure Controller Green (dim) indicator bar graph going down**

Annunciators

1-M-5A

- **1-XA-55-5A Window B-7, LS-3-42D STEAM GEN LVL HIGH-LOW DEVIATION**

Other Symptoms: Deviations or unexpected indications on any of the following may indicate a malfunction of the normal feedwater system:

- Feedwater flow dropping to all steam generators
- Level dropping in all steam generators

T = 30	CREW	Observes indications/symptoms specified above and diagnoses event;

Evaluator Note: The failure affects Steam Dumps, which close, and Main Feed Pump Control will drive 1A Main Feed Pump to minimum speed. There are no initiating alarms; only alarms that result later (i.e.: 1-AR-M5A, B-7, LS-3-42D STEAM GENERATOR LEVEL HIGH-LOW DEVIATION). Crew's primary efforts will be to gain control of Main Feed Pump flow and restore/control SG levels followed by RCS temperature control as the Steam Dumps will go closed. Then, the slower moving RCS temperature change will be identifiable by the SG atmospheric relief valves' operation.

0-SO-1-2, STEAM DUMP SYSTEM Section 7.1 Steam Dump System Shutdown for RCS temperature control on the SG atmospheric relief valves follows AOP-S.01 Section 2.3 guide

Op Test No.:	NRC 2010302	Scenario #	3	Event #	4	Page	26 of	88
Event Description:	PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure							

Time	Position	Applicant's Actions or Behavior
	SRO	SRO implements AOP-S.01, Loss Of Normal Feedwater Section 2.3, Loss of Main Feedwater Pump Control:
	SRO	SRO directs Section 2.3 Immediate Operator Actions (IOAs)
		NOTE: Step 1 is an IMMEDIATE ACTION.
	BOP	1. **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
	BOP	b. **ADJUST** speed on affected MFP(s) to restore feedwater pressure to normal (~1040 psig at full power).
	BOP	2. **DETERMINE** if MFP trip is needed:
		a. **CHECK** BOTH MFWPs in service. ***(RNO Required)***
	BOP/ Crew	**RNO:** **RNO 1st condition N/A- adequate MFW is available:** **a.** **IF** reactor power is greater than AFW flow capability (~ 3%) **AND** adequate feedwater flow CANNOT be maintained… **RNO 2nd condition N/A- adequate MFW is available:** **IF** reactor power less than or equal to AFW flow capability (~ 3%), **AND** S/G levels CANNOT be controlled with main feedwater… **RNO 3rd condition implemented:** **IF** only one MFWP is in service, **THEN GO TO** Caution prior to Step 3.

Op Test No.: NRC 2010302 Scenario # 3 Event # 4 Page 27 of 88

Event Description: PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure

Time	Position	Applicant's Actions or Behavior
	BOP	3. **MAINTAIN** steam generator level(s) on program. [with manual MFP Cont]
	NOTE:	Appendix C may be used to determine program feedwater D/P for current power. [Appendix C attached to end of this event guide]
	BOP	4. **MAINTAIN** MFP discharge pressure on program **USING** ICS or available control board indications. **Places 1-PC-46-20, MFPT 1A & 1B SPEED CONTROL, to MANUAL and raises output**
	CAUTION:	Reactor operation at low power levels for extended periods may challenge reactivity control due to xenon changes.
	RO	5. **CHECK** Reactor power greater than 5%.
	CREW	6. **INITIATE** repairs on failed equipment.
	SRO	7. **GO TO** appropriate plant procedure.
		END OF SECTION - AOP-S.01 Section 2.3

Op Test No.:	NRC 2010302	Scenario #	3	Event #	4	Page	28 of 88
Event Description:	PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure						

Time	Position	Applicant's Actions or Behavior
		0-SO-1-2, Steam Dump System **Section 7.1, Steam Dump System Shutdown**
	BOP	[1] **IF** necessary to transition from steam dumps to S/G atmospheric relief valves for RCS temp control, **THEN PERFORM** the following:
	BOP	[1.1] **ENSURE** S/G atmospheric relief valve controllers set at 84% (1005 psig) or as required for current RCS temp and output signal approximately zero:

S/G	PIC	SETPOINT	OUTPUT	INITIALS
#1	PIC-1-6A	84% (1005 pisg) or as required	~ 0	______
#2	PIC-1-13A	84% (1005 pisg) or as required	~ 0	______
#3	PIC-1-24A	84% (1005 pisg) or as required	~ 0	______
#4	PIC-1-31A	84% (1005 pisg) or as required	~ 0	______

Time	Position	Applicant's Actions or Behavior
	BOP	[1.2] **SLOWLY RAISE [PIC-1-33]** Steam Dump Pressure Control setpoint. **Step is N/A due to PT-1-33 failure**

Evaluator Note: SRO directs OR BOP operator adjusts SG Atmospheric Relief Valves as necessary to maintain unit in MODE 1.

Time	Position	Applicant's Actions or Behavior
	BOP	[1.3] **ADJUST** S/G atmospheric relief valve setpoints to maintain desired RCS temperature.
	BOP	[1.4] **WHEN** steam dump valves fully closed **AND** atmospheric relief valves are controlling RCS temperature, **THEN**
		[1.4.1] **PLACE [HS-1-103A]** Steam Dump Control in OFF position.

Op Test No.:	NRC 2010302	Scenario #	3	Event #	4	Page	29 of 88
Event Description:	PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure						

Time	Position	Applicant's Actions or Behavior
		0-SO-1-2, Steam Dump System **Section 7.1, Steam Dump System Shutdown**
		[1.4.2] **PLACE [HS-1-103B]** Steam Dump Control in OFF position.
		[2] **IF** RHR cooling is established… **Step is N/A (including NOTE preceding step and following substeps)**
		END OF TEXT
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Feedwater/Feed Pump Control and RCS temperature are stabilized in manual control.

Op Test No.:	NRC 2010302	Scenario #	3	Event #	4	Page	30	of	88

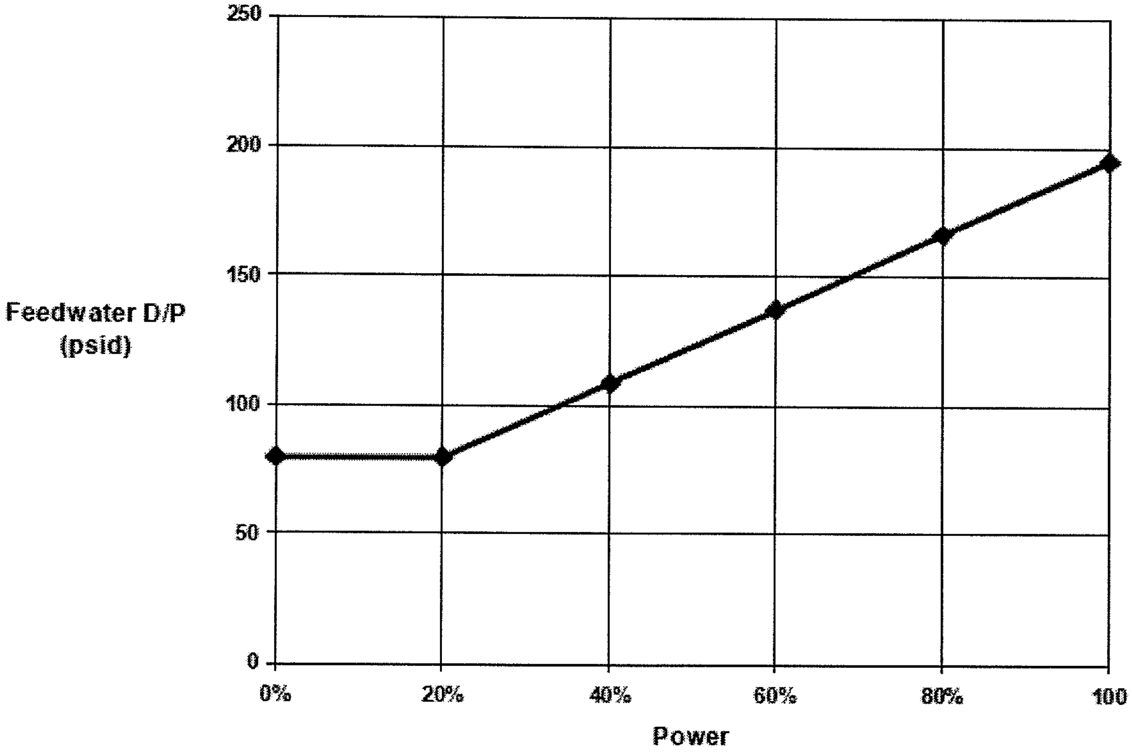
Event Description: PT-1-33, Main Steam Hdr Pressure Transmitter Lo Failure

Appendix C
Page 1 of 1

SQN	MAIN FEEDWATER MALFUNCTIONS	AOP-S.01 Rev. 16

Appendix C

Main Feedwater Pump D/P Program



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Op Test No.: NRC 2010302 Scenario # 3 Event # 5 Page 31 of 88

Event Description: PORV 68-334 fails open (can be closed manually)

Simulator Operator: at Lead Examiner direction, insert Event 5

Indications/Alarms:

Indications

1-M-4:

- **1-XX-68-363A, PZR PORV ACOUSTIC MONITORS: XI-68-334A indicates elevated acoustic (flow) noise;**
- **1-TI-68-331: 68-340.334, XE-340.334 TAILPIPE TEMPS**

1-M-5

- **RCS PR PRESS (Chs 1-4), 1-PI-68-340A, 334, 323, 322: showing RCS (Pzr) pressure going down;**
- **PRT LEVEL, 1-LI-68-300 shows an increasing trend (magnitude proportional to time PORV remained open)**
- **PRT PRESSURE, 1-PI-68-301 shows an increasing trend (magnitude proportional to time PORV remained open)**
- **PRT TEMPERATURE, 1-TI-68-309 shows an increasing trend (magnitude proportional to time PORV remained open)**
- **RCS PZR PRESS Recorder 1-PR-68-340 shows a decreasing pressure trend proportional to time PORV remained open**
- **RCS LOOP 1 HL WIDE RANGE PRESS Recorder 1-PR-68-69 shows a decreasing pressure trend proportional to time PORV remained open**

1-M-6

- **RCS WR HL PRESSURE LOOP 3 1-PI-68-66A, shows a decreasing pressure value;**
- **RCS HL PRESS WIDE RANGE 1-PI-68-62, shows a decreasing pressure value;**
- **RCS HL PRESS WIDE RANGE 1-PI-68-69, shows a decreasing pressure value;**

Annunciators:

1-M-5

- **1-XA-55-5A D-4: "PS-68-340G/F PRESSURIZER PRESSURE LOW BACKUP HTRS ON"**
- **E-2: "TS-68-331 PRESSURIZER POWER RELIEF LINE TEMP HIGH"**
- **1-XA-55-5C B-6: "XS-68-363 PRESSURIZER RELIEF VALVE OPEN"**

Time	Position	Applicant's Actions or Behavior
T = 40	CREW	Respond in accordance with Alarm Response Procedures; Refers US to AOP-I.04 as determined in 1-AR-M5-A, D-4, E-2 and 1-AR-M5-C, B-6; (other ARPs may also apply)
	SRO	US may use AOP-I.04, Pressurizer Instrument And Control Malfunctions Section 2.1, Uncontrolled RCS pressure drop due to open PORV in Modes 1-3

Op Test No.:	NRC 2010302	Scenario #	3	Event #	5	Page	32 of 88

Event Description: PORV 68-334 fails open (can be closed manually)

Time	Position	Applicant's Actions or Behavior
		NOTE: If spray valve is open due to pressure instrument failure, then Section 2.3 is the appropriate entry point.
		1. **DIAGNOSE** the failure:

IF...	GO TO SECTION	PAGE
Uncontrolled RCS pressure drop due to open PORV in Modes 1-3	2.1	4
Uncontrolled RCS pressure drop due to stuck open spray valve	2.2	7
Pressurizer Pressure Instrument OR Controller Malfunction	2.3	11
Pressurizer Level Instrument Malfunction	2.4	20

Time	Position	Applicant's Actions or Behavior
		CAUTION **Partially open PORV may display no light indications.**
		NOTE Step 1 is an IMMEDIATE ACTION.
	RO	1. **CHECK** Pzr PORVs CLOSED:
		• valve position indication • acoustic monitors. ***(RNO Required)***
	RO	**RNO:** **CLOSE** affected PORV and/or block valve as necessary to stop RCS pressure drop. Expected RO actions are to close/attempt to close BOTH • PORV, (w/ 1-HS-68-334A), **AND** • Associated Block Valve (w/ 1-HS-68-333A) **Places 1-HS-68-334A, PZR PORV to CLOSE** (PORV does not respond) **Places 1-HS-68-333A, BLOCK Valve FOR PORV 334, to CLOSE** (Valve closes)
	RO	2. **MONITOR** RCS pressure STABLE or RISING.
	RO	3. **CHECK** SI signal NOT actuated.
	RO	4. **ENSURE** available Pzr heaters ENERGIZED as necessary. :

Op Test No.:	NRC 2010302	Scenario #	3	Event #	5	Page	33	of 88
Event Description:	PORV 68-334 fails open (can be closed manually)							

Time	Position	Applicant's Actions or Behavior
	CAUTION	**RCS pressure changes and changes in RCS boron concentration (due to differences between pzr and RCS boron) may impact core reactivity.**
	RO	5. **MONITOR** reactor power:
		a. **CHECK** reactor in Mode 1 or 2. b. **MONITOR** core thermal power for unexpected changes.
		EVALUATE EPIP-1, Emergency Plan Classification Matrix.
		7. **EVALUATE** the following Tech Specs for applicability: • 3.2.5, DNB Parameters **3.2.5 LCO states:** The following DNB related parameters shall be maintained within the limits shown on Table 3.2-1: a. Reactor Coolant System (RCS)Tavg b. Pressurizer Pressure c. RCS Total Flow Rate • 3.4.3.2, PORVs **3.4.3.2 LCO states:** Two power relief valves (PORVs) and their associated block valves shall be OPERABLE. **TS 3.4.3.2 Action b.:** w/ 1 PORV inoperable & incapable of RCS pressure control, w/i 1 hr restore PORV to OPERABLE or close associated block valve & remove power from the block valve; restore PORV to OPERABLE w/i following 72 hrs or HT STBY w/i next 6 hrs & HT SHDN w/i following 6 hrs.
Evaluator Note:		3.2.5 DNB related parameter on Table 3.2-1.b. Pressurizer Pressure is stated as ≥2220 **psia*** (or entry required @ ≤2205 psig as indicated on the MCB instrumentation) Tech Spec Bases for 3.4.3.2, PORV OPEABILITY follows this event guide; PORV OPERABILITY discussion needs to include this.
		• 3.2.5.b DNB Parameters: The following DNB related parameters shall be maintained within the limits shown on Table 3.2-1: a. Reactor Coolant System (RCS) Tavg: ≤583°F b. Pressurizer Pressure: ≥2220 psia* c. RCS Total Flow Rate: Figure 3.2-1 d. Total Flow: [Figure 3.2-1] Applies – restore the parameter (Pressurizer Pressure) w/i 2 hrs. or reduce to ≤5% RTP w/i the next 4 hrs.

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Event Description:	PORV 68-334 fails open (can be closed manually)						

Time	Position	Applicant's Actions or Behavior
		8. **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. **(Included following this event guide)**
		9. **CHECK** the following NORMAL:
		10. **ENSURE** WO initiated on failed equipment.
		11. **GO TO** appropriate plant procedure.
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 US completes Tech Spec evaluation or directs return to appropriate plant procedures.		

Time	Position	Applicant's Actions or Behavior
0-SO-68-3, Section 8.3 Isolation of a Leaking or Inoperable Pressurizer PORV		
		NOTES 1) This section may be used to isolate a PORV which is leaking or inoperable OR to remove power from PORV and/or block valve to comply with LCO 3.4.3.2. 2) Steps 8.3[5] and/or 8.3[6] may be performed prior to Steps 8.3[1] - 8.3[4] if PORV must be isolated promptly due to leakage OR if necessary to meet Tech Spec action time limits. 3) If RCS is or has been water solid, water in the bonnet of PORVs will significantly slow the valve stroke time due to hydraulic locking. Several valve strokes may be required to clear the water from valve bonnet following solid water operations.

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Event Description:	PORV 68-334 fails open (can be closed manually)						

Time	Position	Applicant's Actions or Behavior
	SRO	[1.] **IF** unit is in Modes 1-3, **THEN REFER TO** Tech Spec LCO 3.4.3.2 and basis section to evaluate impact on PORV and block valve operability.
		[2.] **IF** unit is in Mode 4 or 5,...N/A
		[3.] **NOTIFY** Work Week Manager to evaluate impact of inoperable PORV and/or closed block valve on overall plant risk
		CAUTION **Closure of PORV block valve may conflict with App. R fire safe shutdown analysis for AB el. 714 General Area and 6.9KV Shutdown Board Rm A or B. In these areas, one PORV is credited with NO power available to block valve (i.e. block valve is assumed to remain open without power). If 1-FCV-68-333 or 2-FCV-68-332 is closed, the credited PORV may NOT be available.**
		NOTES 1) If applicable, the following step directs establishing fire watch in affected areas. Continuous or hourly fire watch should be used consistent with FOR 3.7.12. Fire watch may be terminated or marked N/A if acceptable alternate comp measures evaluated by the Fire Protection Program Owner (Engineering) are implemented. 2) Unavailability of credited PORV during fire may delay establishing RHR conditions but would NOT be expected to significantly degrade plant safety. Therefore, closing block valve is NOT expected to be immediately reportable under 10CFR50.72.
		[4.] **IF** unit is in Mode 1-4, **THEN PERFORM** the following:
		[4.1] **ENSURE** SR initiated to document condition and evaluate impact on App. R fire safe shutdown.
		[4.2] Unit 1 Only: **IF** 1-FCV-68-333 will remain closed in Mode 1-4, **THEN** **ESTABLISH** fire watch in the following areas: • AB el. 714 General Area (Unit 1 side). • 6.9KV Shutdown Board Room A.
		[4.3] Unit 2 Only...N/A

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Event Description: PORV 68-334 fails open (can be closed manually)

Time	Position	Applicant's Actions or Behavior
		[5.] **IF** block valve must be closed to isolate leaking PORV **OR** to comply with LCO 3.4.3.2 action, **THEN PERFORM** the following:
		[5.1] **CLOSE** affected valve: (N/A valve not closed)

VALVE	SWITCH UNID	INITIALS	IV
Block Valve for PORV 340A (FCV-68-332)	HS-68-332A	________	________
Block Valve for PORV 334A (FCV-68-333)	HS-68-333A	________	________

Time	Position	Applicant's Actions or Behavior
		[5.2] **IF** PORV block valve must be de-energized to comply with Tech Spec LCO 3.4.3.2, **THEN PLACE** affected breaker to **OFF** (N/A the others).

UNIT	VALVE	BREAKER UNID	INITIALS	CV
1	1-FCV-68-332	1-BCTD-68-332-B 480V Rx MOV Bd 1B1-B Compt 12E	________	________
	1-FCV-68-333	1-BCTD-68-333-A 480V Rx MOV Bd 1A1-A Compt 9E	________	________
2	2-FCV-68-332	2-BCTD-68-332-B 480V Rx MOV Bd 2B1-B Compt 12E	________	________
	2-FCV-68-333	2-BCTD-68-333-A 480V Rx MOV Bd 2A1-A Compt 9D	________	________

NOTE

To comply with OPDP-7 (Fuse Control), fuses removed must be bagged, labeled, and stored in an approved storage location.

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Event Description:	PORV 68-334 fails open (can be closed manually)						

Time	Position	Applicant's Actions or Behavior
		[6.] **IF** PORV solenoid valve must be de-energized to comply with Tech Spec LCO 3.4.3.2, **THEN REMOVE** fuses for affected valve: (N/A the others)
		[7.] **ENSURE** caution order or off-normal tag is placed on affected block valve or PORV handswitch. (N/A if handswitch will be danger-tagged)
		[8.] **ENSURE** SR initiated. SR # _______________.
		[9.] **PLACE** this procedure in active procedures book UNTIL ready to restore block valve/PORV to normal.

End of Section 8.3,
0-SO-68-3

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Event Description: PORV 68-334 fails open (can be closed manually)

3/4.4 REACTOR COOLANT SYSTEM BASES

3/4.4.3 SAFETY AND RELIEF VALVES - OPERATING

The power operated relief valves (PORVs) and steam bubble function to relieve RCS pressure during all design transients up to and including the design step load decrease with steam dump. Operation of the PORVs minimizes the undesirable opening of the spring-loaded pressurizer code safety valves. Each PORV has a remotely operated block valve to provide positive shutoff capability should a relief valve become inoperable. The PORVs also function to remove non-condensable or steam from the pressurizer.

The OPERABILITY of the power-operated relief valves (PORVs) and block valves is determined on the basis of their being capable of performing the following functions:

a. Manual control of PORVs to control reactor coolant system pressure. This is a function that is used for a steam generator tube rupture accident.

b. Maintaining the integrity of the reactor coolant pressure boundary. This is a function that is related to controlling identified leakage and ensuring the ability to detect unidentified reactor coolant pressure boundary leakage.

c. Manual control of the block valve to: (1) unblock an isolated PORV to allow it to be used for manual control of reactor coolant system pressure (Item A), and (2) isolate a PORV with excessive seat leakage (Item B)

d. Manual control of a block valve to isolate a stuck-open PORV.

Surveillance requirements (SR) provide assurance that the PORVs and block valves can perform their functions. The block valves are exempt from the SR to cycle the valves when they have been closed to comply with the ACTION requirements. This precludes the need to cycle the valves with full system differential pressure or when maintenance is being performed to restore an inoperable PORV to operable status.

Testing of PORVs with a steam bubble in the pressurizer is considered to be a representative test for assessing PORV performance under normal operating conditions.

From: SEQUOYAH - UNIT 1, Amendment No. 12, 133, 157, 308, June 16, 2006, Page B 3/4 4-2

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Event Description:	RCS Leak						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: at Lead Examiner direction, insert Event 6		

Indications/Alarms:

Indications

1-M-4:

- **RCS PZR LVL, 1-LI-68-339A, shows a decreasing level value**
- **RCS PZR LVL, 1-LI-68-335A, shows a decreasing level value**
- **RCS PZR LVL, 1-LI-68-320, shows a decreasing level value**
- **1-XI-94-101/102, Core Exit Temp Margin to Saturation (exo sensors Trn A & B) pressure indications trending down.**

1-M-5:

- **RCS PR PRESS (Chs 1-4), 1-PI-68-340A, 334, 323, 322: showing RCS (Pzr) pressure going down;**
- **RCS PZR PRESS Recorder 1-PR-68-340 shows a decreasing pressure trend;**
- **RCS LOOP 1 HL WIDE RANGE PRESS Recorder 1-PR-68-69 shows a decreasing pressure trend.**

1-M-6:

- **RCS WR HL PRESSURE LOOP 3 1-PI-68-66A, shows a decreasing pressure value;**
- **RCS HL PRESS WIDE RANGE 1-PI-68-62, shows a decreasing pressure value;**
- **RCS HL PRESS WIDE RANGE 1-PI-68-69, shows a decreasing pressure value;**

Annunciators

1-M-5:

- **1-XA-55-5C Window B-1: "TS-30-31 LOWER COMPT TEMP HIGH"**
- **B-3: "TS-30-241 LOWER COMPT MOISTURE HI"**
- **B-4: "TS-30-240 LOWER COMPT MOISTURE HI"**

1-M-6:

- **1-XA-55-6E Window C-6: "ZS-61-186 ICE CONDENSER LOWER INLET DOOR OPEN"**

T = 50	CREW	Respond in accordance with Alarm Response Procedures

Evaluator Note: The RCS leak occurs and progresses into a SBLOCA. The crew responds using this procedure, AOP-R.05 Section 2.1 for lowering Pzr level/RCS pressure and increasing Containment pressure; this situation could also present a challenge to VCT Make-up capability. MONITOR steps 2, Pzr Level, 3, Containment Pressure, 4, RCS Pressure or MAINTAIN step 5, VCT Make-up capability are all potential Rx Trip initiators for this event depending on crew pace and actions.

Evaluator Note: At the **Lead Examiner direction,** leak size will increase requiring the crew to initiate a reactor trip and enter E-0.

Reactor Trip criteria contained in **MONITOR** steps 2, 3, 4 and/or **MAINTAIN** step 5. SRO/Crew should determine/state trip criteria

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
	SRO	SRO uses AOP-R.05, RCS LEAK AND LEAK SOURCE IDENTIFICATION Section 2.1, RCS Leak in Mode 1-3
T = 50	CREW	Respond in accordance with Alarm Response Procedures
	RO	1. **CONTROL** charging flow using one CCP:
		• **ADJUST** FCV-62-93 and FCV-62-89 as necessary to maintain pzr level on program. • **MAINTAIN** seal injection flow at least 6 gpm to each RCP.
	RO	2. **MONITOR** pressurizer level STABLE or RISING. ***(RNO required)***
	SRO RO	**RNO: IF** sufficient time is available, **THEN ISOLATE** normal and excess letdown: a. **ENSURE** FCV-62-72, 73, and 74 CLOSED. b. **CLOSE** FCV-62-69 and 70. c. **ENSURE** FCV-62-54 and 55 CLOSED.
Evaluator Note:		Since this is a **"MONITOR"** step, the crew may continue in the procedure while developing a Pzr/RCS pressure trend. If so, steps 3 or 4 could be the decision point and therefore initiate the reactor trip and E-0 implementation. If a loss of RCS pressure develops, the crew may decide to trip the reactor and transition to E-0 based on this.
	SRO	**IF** loss of pressurizer level is imminent **OR** low pressure reactor trip (1970 psig) is imminent, **THEN PERFORM** the following: a. **TRIP** the reactor. b. **INITIATE** Safety Injection. c. **GO TO** E-0, Reactor Trip or Safety Injection.
	RO	3. **MONITOR** containment pressure STABLE or DROPPING. ***(RNO required)***
		RNO: **IF** containment pressure is approaching 1.5 psig, **THEN PERFORM** the following: a. **TRIP** the reactor. b. **INITIATE** Safety Injection. c. **GO TO** E-0, Reactor Trip or Safety Injection.

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Event Description:	RCS Leak						

Time	Position	Applicant's Actions or Behavior
	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	4. **MONITOR** RCS pressure STABLE or RISING. ***(RNO required)***
		RNO: **IF** Unit is in Mode 1 or 2 **AND** RCS pressure is approaching 1970 psig (dropping), **THEN TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection.
		IF Unit is in Mode 3**... N/A**
Evaluator Note:	RCS leak will progress into a SBLOCA. As the crew responds using AOP-R.05 Section 2.1, the lowering Pzr level and increased charging flow may result in a challenge to VCT Make-up capability. Subsequently the crew may initiate a reactor trip and enter E-0 based on this step.	
	RO	5. **MAINTAIN** VCT level greater than 13% **USING** automatic or manual makeup.
		RNO: **IF** leak is on charging header in Aux Bldg**... N/A.** **IF** VCT level CANNOT be maintained, **THEN PERFORM** the following: a. **ENSURE** CCP suction aligned to RWST: 1) **OPEN** LCV-62-135 and -136. 2) **CLOSE** LCV-62-132 and 133. b. **IF** in MODE 1 or 2, **THEN TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection.
	RO/BOP	RO and/or BOP operator should monitor pocket sump level (1-M-15, indicators 1-LI-77-410 & 77-411).
	RO/BOP	RO and/or BOP operator should containment radiation levels (on (0-M-12, recorders and modules 1-RR-90-105 and 1-RR-90-112 for lower and upper containment, resp.)

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
	SRO	Expected to direct [BOP operator] to perform Appendices I and/or J; (Included at end of this event guide)
	BOP	Perform Appendices I and/or J, as directed.
	NOTE 1: Appendix I or J may be used to estimate RCS leak rate.	
	NOTE 2: If letdown was isolated in Step 2, the leak rate may have exceeded capacity of one CCP in the normal charging alignment (EAL 1.2.2P).	
	SRO	6. **EVALUATE** EPIP-1, Emergency Plan Classification Matrix.
	SRO	7. **EVALUATE** Tech Spec/TRM LCOs **USING** Appendix K, Evaluating Tech Specs and TRM.
		OPERATIONAL LEAKAGE TS 3.4.6.2.b, 1 GPM UNIDENTIFIED LEAKAGE Action a: w/ any PRESSURE BOUNDARY LEAKAGE or primary-to-secondary leakage not w/i limits, be in HT STDY w/i 6 hrs & in CLD SHDN w/I following 30 hrs.
	BOP	8. **CHECK** secondary side radiation NORMAL:
		• S/G blowdown rad monitor • Condenser vacuum exhaust rad monitor • Main steam line rad monitors.
	BOP	9. **STOP** containment purging and venting:
		a. **IF** containment purge in progress, **THEN ENSURE** containment purge fans STOPPED. b. **ENSURE** containment purge and vent dampers CLOSED.
	BOP	10. **CHECK** containment airborne activity RISING. (RM-90-106 or 112)
Evaluator Note: RCS leak source is not determinable using this procedure's diagnostics. Therefore the crew will continue with the following isolation measures and leakage monitoring ultimately arriving at the conclusion that RCS leakage exceeds the Tech Spec unidentified leakage limit (or until the Lead Examiner directs leak size change according to the scenario guide).		
	CREW	11. **CHECK** leakage source UNKNOWN.
	RO	12. **CHECK** pressurizer PORVs NORMAL:

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Event Description:	RCS Leak								

Time	Position	Applicant's Actions or Behavior
		• Tailpipe temperature • Acoustic monitors
		13. **ISOLATE** letdown:
	RO	a. **ENSURE** the following letdown orifice valves CLOSED: • FCV-62-72 • FCV-62-73 • FCV-62-74
	RO	b. **ENSURE** the following letdown isolation valves CLOSED: • FCV-62-69 • FCV-62-70 • FCV-62-77
	RO/ BOP	c. **CHECK** leak ISOLATED based upon the following • containment parameters • estimated leak rate **USING** Appendix I or J. ***(RNO required)***
	SRO	**RNO:** c. **IF** leak is NOT isolated, **THEN GO TO** Step 14.
	RO	14. **ISOLATE** charging:
		a. **ENSURE** letdown orifice valves CLOSED: • FCV-62-72 • FCV-62-73 • FCV-62-74
	RO	b. **ENSURE** the following charging header isolation valves CLOSED: • FCV-62-90 • FCV-62-91 • FCV-62-85 • FCV-62-86.
	RO/ BOP	c. **CHECK** leak ISOLATED based upon the following • containment parameters • estimated leak rate **USING** Appendix I or J. ***(RNO required)***

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
	SRO	**RNO:** c. **IF** leak is NOT isolated, **THEN PERFORM** the following:
Evaluator Note:	EA-62-5 follows this event guide.	
	RO/ BOP	1) **IF** normal charging is required to maintain Pzr level, **THEN RESTORE** normal charging **USING** EA-62-5.
	SRO	2) **IF** running CCP must be stopped… **N/A**
	SRO	3) **GO TO** Step 15.
	RO	15. **CHECK** Pzr safety valves NORMAL:
		• Tailpipe temperature • Acoustic monitors
	RO	16. **CHECK** PRT conditions NORMAL:
		• Level • Pressure • Temperature
	BOP	17. **NOTIFY** Chemistry to ensure all primary side sample valves CLOSED. [Hot Sample Room]
	BOP	18. **CHECK** CCS parameters NORMAL:
		• CCS radiation monitors NORMAL • CCS surge tank level STABLE.
	RO	19. **CHECK** all CLA levels NORMAL.
	RO	20. **CHECK** excess letdown heat exchanger NORMAL (if applicable):
		• Temperature • Pressure
	RO	21. **CHECK** TI-68-398, Reactor Vessel Head Vent Temperature NORMAL. [M-4]

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
	RO	22. **CHECK** TI-68-21, reactor vessel flange leakoff temperature NORMAL. [M-5]
	BOP	23. **MONITOR** auxiliary building radiation and HELB recorders NORMAL.
Evaluator Note: RCS leak is ≈90 gpm and **NOT** isolated.		
	RO/BOP	RO and/or BOP operator should monitor pocket sump level (1-M-15, indicators 1-LI-77-410 & 77-411).
	RO/BOP	RO and/or BOP operator should containment radiation levels (on (0-M-12, recorders and modules 1-RR-90-106 and 1-RR-90-112 for lower and upper containment, resp.)
	SRO	Expected to direct [BOP operator] to perform Appendices I and/or J; (Included at end of this event guide)
	BOP	Perform Appendices I and/or J, as directed
	SRO	24. **CHECK** leak IDENTIFIED and ISOLATED **USING** available methods:
	BOP	• Appendix I or J (Estimating Leak Rate) • containment parameters (radiation, pressure, humidity) • pocket sump level rate of rise on ICS (instantaneous point U0964 or U0965, 15 min avg. point U0967 or U0968) • Rx Bldg (raceway) sump rate of rise (ICS point U0966) • local observation (if applicable) ***(RNO Required)***
		RNO: **IF** leak is NOT isolated, **THEN PERFORM** the following:
		a. **IF** additional cooling is required, **THEN PERFORM** Appendix H, Additional Containment Cooling.
Evaluator Note: SRO/RO may choose to not start additional cooling fans based on containment pressure trends following the initial pressure increase. Evaluation, however, is expected.		
		RO is expected to maintain saturated conditions in the Pzr by verifying adequate heater operation to maintain Pzr Vapor/Liquid temps equivalent (1-M-4: Pzr TEMP indicators 1-TI-68-324 & 1-TI-68-319)
	RO	b. **IF** pressurizer level is above program **AND** rising, **THEN PERFORM**

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
		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.
Evaluator Note: RCS leak is ≈90 gpm and **NOT** isolated.		
		c. **ATTEMPT** to estimate RCS leak rate **USING** one of the following:
		• Appendix I (if leak requires rise in charging flow greater than ~10 gpm) OR • Appendix J (requires NO VCT makeup, dilution, or boration flow)
		d. **IF** conditions permit, **THEN DETERMINE** RCS leak rate **USING** 0-SI-OPS-068-137.0, Reactor Coolant System Water Inventory. **This step N/A**
		e. **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. OR • 0-GO-6, Power Reduction from 30% to Hot Standby.
	RO	f. **IF** containment purging or venting is desired, **THEN PERFORM** the following:
		1) **NOTIFY** Chem Lab to evaluate off-site dose **USING** 0-SI-CEM-030- 410.1 or 410.2, as applicable. 2) **EVALUATE** resuming containment purging or venting **USING** 0-SO-30-3 or 0-SO-30-8, as applicable. **This step N/A**
	SRO	g. **IF** leak source has NOT been determined, **THEN GO TO** Section 2.3, RCS Leak Source Identification.

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
	RO	25. **MONITOR** if charging and letdown should be restored:
		a. **CHECK** letdown ISOLATED.
		b. **CHECK** Pzr level:
		• level greater than or equal to program level • level RISING.
		c. **CHECK** charging and normal letdown AVAILABLE:
		• piping INTACT • valves OPERABLE • Train A CCS in service.
		d. **RESTORE** CVCS charging and letdown **USING** EA-62-5, Establishing Normal Charging and Letdown.
	RO	26. **MONITOR** if pressurizer heaters should be restored:
		a. **CHECK** pressurizer level greater than 20% and rising. b. **ENSURE** pressurizer heaters in service as required.
	SRO	27. **IF** containment purging or venting is needed, **THEN PERFORM** the following:
		a. **IF** leak was inside containment, **THEN NOTIFY** Chem Lab to evaluate off-site dose **USING** 0-SI-CEM-030-410.1 or 410.2, as applicable. b. **EVALUATE** resuming containment purging or venting **USING** 0-SO-30-3 or 0-SO-30-8, as applicable.
	SRO	28. **INITIATE** leak repairs.
	SRO	29. **GO TO** appropriate plant procedure.
		END OF SECTION
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief. <u>Operations Management</u> - Typically Shift Manager. <u>Maintenance Personnel</u> – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the

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Event Description:	RCS Leak							

Time	Position	Applicant's Actions or Behavior
		Shift Manager).
Lead Examiner may cue the next event as desired.		

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
		EA-62-5, Establishing Normal Charging and Letdown
		4.0 OPERATOR ACTIONS
		4.1 Section Applicability
		1. IF normal charging flow is to be established, **THEN GO TO** Section 4.2.
		2. IF normal letdown flow is to be established, **THEN GO TO** Section 4.3.
		4.2 Establishing Normal Charging Flow
		1. **VERIFY** at least one CCP RUNNING.
		2. **CLOSE** seal water flow control valve **[FCV-62-89]**.
		3. **OPEN** charging header isolation valves:
		• **[FCV-62-90]** • **[FCV-62-91]**
		4. **OPEN** one of the following charging isolation valves:

CHARGING ISOLATION VALVES	ONE OPEN √
FCV-62-86 (normal charging)	☐
FCV-62-85 (alternate charging)	☐

Time	Position	Applicant's Actions or Behavior
		5. **ESTABLISH** at least 55 gpm charging flow **USING** seal water and charging flow control valves **[FCV-62-89]** and **[FCV-62-93]**.
		6. **ADJUST** seal injection flow to each RCP to between 6 gpm and 13 gpm.
	CAUTION	If emergency boration is in progress, the automatic control of FCV-62-93 may result in reduced boration flow.
		7. **IF** automatic level control desired **AND** pressurizer level greater than 25% **THEN PLACE** charging flow control valve **[FCV-62-93]** in AUTO.

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Event Description: RCS Leak

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td></td><td>EA-62-5,
Establishing Normal Charging and Letdown</td></tr>
<tr><td></td><td></td><td>8. GO TO Section 4.1, step in effect.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>4.3 Establishing Normal Letdown Flow</td></tr>
<tr><td></td><td colspan="2">NOTE EA-62-3, Establishing Excess Letdown, may be utilized if Normal Letdown cannot be established.</td></tr>
<tr><td></td><td></td><td>1. IF charging flow NOT established, THEN PERFORM Section 4.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>2. VERIFY pressurizer level greater than 17%.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>3. ENSURE letdown orifice isolation valves CLOSED:</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>LETDOWN ORIFICE ISOLATION VALVES</th><th>CLOSED √</th></tr>
<tr><td>FCV-62-72</td><td>☐</td></tr>
<tr><td>FCV-62-73</td><td>☐</td></tr>
<tr><td>FCV-62-74</td><td>☐</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>4. OPEN letdown isolation valves:</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>LETDOWN ISOLATION VALVES</th><th>OPEN √</th></tr>
<tr><td>FCV-62-69</td><td>☐</td></tr>
<tr><td>FCV-62-70</td><td>☐</td></tr>
<tr><td>FCV-62-77</td><td>☐</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">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.</td></tr>
<tr><td></td><td></td><td>5. PLACE [HIC-62-78] in MANUAL, AND OPEN [TCV-70-192] to ~50%.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.:	NRC 2010302	Scenario #	3	Event #	6	Page	51 of 88
Event Description:	RCS Leak						

Time	Position	Applicant's Actions or Behavior
		EA-62-5, **Establishing Normal Charging and Letdown**
		6. **PLACE** letdown pressure controller **[PCV-62-81]** in MANUAL and **ADJUST** output between 40% and 50%, (50%-60% open).
		7. **ADJUST** charging flow as necessary to prevent flashing in the letdown line.
		8. **OPEN** letdown orifice isolation valves as needed:
	NOTE:	Normal letdown pressure is 325 psig at normal operating temperature.
		9. **ADJUST** letdown pressure controller **[PCV-62-81]** output to obtain desired pressure.
		10. **ADJUST** letdown pressure controller **[PCV-62-81]** setpoint to match existing pressure.
		11. **PLACE** letdown pressure controller **[PCV-62-81]** in AUTO.
	NOTE:	Normal letdown temperature is ~100°F.
		12. **ADJUST [HIC-62-78A]** to obtain desired letdown temperature, as indicated on **[TI-62-78]**.
		13. **PLACE [HIC-62-78A]** in **AUTO**.

Step 8 table:

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

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
		EA-62-5, **Establishing Normal Charging and Letdown**
	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.	
		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.
		15. **ENSURE** high temperature divert valve **[HS-62-79A]** in DEMIN position.
		16. **ADJUST** charging and letdown as necessary to maintain RCP seal injection flow and pressurizer level.
		17. **IF** CCP suction is aligned to the RWST and realigning CCP suction to VCT is desired, **THEN ENSURE** VCT aligned for normal operation:
		a. **ESTABLISH** VCT level greater than 20%. b. **ENSURE** VCT outlet valves ALIGNED:

COMPONENT	POSITION √	
LCV-62-132	OPEN	☐
HS-62-132	PULL A-P AUTO	☐
LCV-62-133	OPEN	☐
HS-62-133	PULL A-P AUTO	☐

		c. **ENSURE** RWST supply to CCP suction valves ALIGNED for normal operation:

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Event Description: RCS Leak

Time	Position	Applicant's Actions or Behavior
		EA-62-5, Establishing Normal Charging and Letdown
		COMPONENT: POSITION √ LCV-62-135: CLOSED ☐ HS-62-135: PULL A-P AUTO ☐ LCV-62-136: CLOSED ☐ HS-62-136: PULL A-P AUTO ☐
		d. **ENSURE** VCT makeup control system set for automatic operation with current boron concentration.
		e. **ENSURE** Primary Water system in service.
		18. **GO TO** Section 4.1, step in effect.
		END OF TEXT

Op Test No.:	NRC 2010302	Scenario #	3	Event #	6	Page	54 of 88
Event Description:	RCS Leak						

SQN	RCS LEAK AND LEAK SOURCE IDENTIFICATION	AOP-R.05 Rev. 14

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APPENDIX K

EVALUATING TECH SPECS AND TRM

1. **EVALUATE** the following Tech Spec/TRM LCOs for applicability:

    - 3.2.5, DNB parameters
    - 3.4.3.1, Safety and Relief Valves-Operating
    - 3.4.3.2, Relief Valves-Operating
    - 3.4.6.2, RCS Leakage
    - 3.4.6.3, RCS Pressure Isolation Valve Leakage
    - TRM 3.4.11, Reactor Coolant System Head Vents
    - 3.4.12, Low Temperature Over Pressure Protection Systems
    - 3.6.1.4, Containment Pressure
    - 3.6.1.5, Containment Air Temperature

END

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Event Description: RCS Leak

SQN	**RCS LEAK AND LEAK SOURCE IDENTIFICATION**	**AOP-R.05** **Rev. 14**

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APPENDIX I

ESTIMATING RCS LEAK RATE USING CVCS FLOW BALANCE

NOTE 1 This method is recommended when leak requires rise in charging flow greater than ~10 gpm. Appendix J is more accurate for smaller leak rates.

NOTE 2 This appendix assumes RCS temperature and charging flow are approximately constant.

	INITIAL	FINAL	CHANGE
PZR Level			[1] (negative for level decrease)
Time			[2]
Charging Flow	[3]		
Letdown Flow	[4]		
Total RCP Seal Return Flow	[5]		

Pressurizer Level Conversion

Pressurizer level change ______ % (step [1] above) X conversion factor 62 gal / % ÷ Time Change ______ min (step [2] above) = Pzr Level Rate of Change (positive for level rising) ______ gpm [6]

Leak Rate Calculation

Charging Flow ______ (step [3] above) – Letdown Flow ______ (step [4] above) – Seal Return Flow ______ (step [5] above) – Pzr Level Rate of Change ______ (step [6] above) + Instrument error correction factor 3 gpm = RCS Leak Rate ______ gpm

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Event Description: RCS Leak

SQN	RCS LEAK AND LEAK SOURCE IDENTIFICATION	AOP-R.05 Rev. 14

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APPENDIX J

ESTIMATING RCS LEAK RATE USING VCT AND PZR LEVEL

CAUTION **This appendix CANNOT be used during VCT makeup, boration, or dilution.**

NOTE This appendix assumes RCS temperature is approximately constant.

	VCT LEVEL (%)	PZR LEVEL (%)	TIME (min)
INITIAL			
FINAL			
CHANGE	[1] (positive for level decrease)	[2] (positive for level decrease)	[3]

VCT Level Conversion

VCT level change		conversion factor		Time Change		VCT Level Rate of Change (positive for level lowering)
%	X	20 gal / %	÷	min	=	gpm
step [1] above				step [3] above		[4]

Pressurizer Level Conversion

Pressurizer level change		conversion factor		Time Change		Pzr Level Rate of Change (positive for level lowering)
%	X	62 gal / %	÷	min	=	gpm
step [2] above				step [3] above		[5]

Leak Rate Calculation

VCT Level Rate of Change		Pzr Level Rate of Change		RCS Leak Rate
	+		=	gpm
step [4] above		step [5] above		

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Op Test No.:	NRC 2010302	Scenario #	3	Event #	**ES-1.1**	Page	57 of 88
Event Description:	SI Termination						

Time	Position	Applicant's Actions or Behaviors

Simulator Operator: at Lead Examiner direction, insert Event 7

Indications available:

1-M-4:

- **1-XI-94-101/102, Core Exit Temp Margin to Saturation (exo sensors Trn A & B) pressure indications trending to SI actuation pressure value.**
- **1-LI-68-339A, 335A, 320A, RCS PZR LEVEL indicators trending down (<5%)**

1-M-5:

- **1-PI-68-340A, 1-PI-68-334, 1-PI-68-323, 1-PI-68-322, RCS PZR PRESS narrow range indicators trending to Rx Trip/SI actuation pressure values.**
- **1-PR-68-69, RCS LOOP 1 HL WIDE RANGE PRESS indicator trending to Rx Trip/SI actuation pressure value.**
- **1-PR-68-340, RCS PZR PRESS Recorder trending down;**
- **1-PR-68-69, RCS LOOP 1 HL WIDE RANGE PRESS Recorder trending down;**
- **1-LR-68-339, RCS PZR LEVEL Recorder trending down;**
- **1-FI-68-93A, CHARGING HDR FLOW Indicator indicating 115-120 gpm (1 CCP at maximum flowrate);**

1-M-6:

- **1-LI-62-129, VCT LEVEL Indicator trending down w/ VCT M-U in progress;**
- **1-FI-62-139A, BORIC ACID TO BLENDER Indicator stable at ~20-25 gpm;**
- **1-FI-62-142A, PRIMARY WATER TO BLENDER Indicator stable at ~70 gpm;**
- **1-PI-68-66A, HL Pressure LOOP 3 indicator trending to actuation pressure value.**
- **1-PI-68-62, RCS HL Press WR indicator trending to actuation pressure value.**
- **1-PI-68-69, RCS HL Press WR indicator trending to actuation pressure value.**
- **1-PDI-30-42, 43, 44, 45, CNTMT PRESSURE WIDE RANGE Indicators trending up (1.5 psi-SI Actuation)**

	CREW	Identifies Reactor Trip criteria contained in **MONITOR** steps 2, 3, 4 and/or **MAINTAIN** step 5. SRO/Crew should determine/state trip criteria.
	SRO	Directs RO to manually trip the reactor and manually actuate SI.
	SRO	Directs entry to E-0, Reactor Trip or Safety Injection and perform Immediate Operator Actions (IOAs)
	RO	Manually trips reactor, verifies reactor tripped and actuates SI per SRO directions.

Evaluator Note: Following IOA performance, prior to Steps 1-4 immediate action verification, RO/BOP surveys MCBs for any expected automatic system response that failed to occur. Upon discovery, they may take manual action(s) to align plant systems as expected for the event in progress. (Ref. EPM-4, Prudent Operator Actions)

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Event Description: SI Termination

Time	Position	Applicant's Actions or Behaviors
E-0, *Reactor Trip or Safety Injection*		
Evaluator Note: High Containment Pressure is expected (2.8 psig) during the course of EOP conduct; the crew should identify the ORANGE PATH condition and enter FR-Z.1, High Containment Pressure (attached following this event guide).		
Note 1 Steps 1 through 4 are immediate action steps		
Note 2 This procedure has a foldout page		
	RO	1. **VERIFY** reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
	BOP	2. **VERIFY** turbine TRIPPED: • Turbine stop valves CLOSED.
Evaluator Note: Loss of offsite power occurs 5 Minutes after SI actuation; Crew should attempt to start both EDGs at this point ensuring at least 1 EDG is running following the loss of offsite power.		
	BOP	3. **VERIFY** at least one train of shutdown boards ENERGIZED. • Attempt to restore power to at least ONE train of shutdown boards • Place DG 1A-A control switch in START • Verify Train A Shutdown Boards ENERGIZED
	BOP	Dispatch AUO to locally reset 1B-B EDG
	RO	4. **DETERMINE** if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated)
	BOP	5. **PERFORM** ES-0.5, Equipment Verifications WHILE continuing in this procedure (attached following EOPs).

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Event Description:	SI Termination						

Time	Position	Applicant's Actions or Behaviors
	RO	6. **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 all S/Gs. (Heat Sink is available from Train A and TDAFW)
	RO	7. **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 AND STEAMLINE PRESS ISOL SI BLOCK RATE ISOL ENABLE permissive DARK [M-4A, A4] OR • Any S/G pressure dropping UNCONTROLLED. OR • Phase B actuation b. **ENSURE** MSIVs and MSIV bypass valves CLOSED. [Main Steam lines will isolate on Phase B (actuation setpoint- 2.8 psig)]
	SRO	c. **ENSURE** applicable Foldout Page actions COMPLETED.
Evaluator Note: **ØB** actuation time: ____________		
	NOTE:	Loss of seal injection flow could adversely affect RCP seals.
	RO	8. **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
	RO	9. **MONITOR** RCS temperatures: • IF any RCP running, THEN CHECK T-avg stable at or trending between 547°F and 552°F OR • IF RCPs stopped, THEN CHECK T-cold stable or trending to between

Op Test No.:	NRC 2010302	Scenario #	3	Event #	**ES-1.1**	Page	60	of	88
Event Description:	SI Termination								

Time	Position	Applicant's Actions or Behaviors
		547°F and 552°F.
	RO	10. **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.
	RO/BOP	11. :**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.
	RO/BOP	12. **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	13. **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) ***(RNO Required)***
	SRO	**RNO:** **PERFORM** the following: a. **INITIATE** ES-0.5 Appendix D, Hydrogen Mitigation Actions. b. **MONITOR** status trees. c. **GO TO** E-1, Loss of Reactor or Secondary Coolant.
	SRO	Directs entry to E-1, Loss of Reactor or Secondary Coolant

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Event Description: SI Termination

Time	Position	Applicant's Actions or Behaviors
Evaluator Note:		at E-0 Step 11.a, **MONITOR** status trees, the crew will implement status tree monitoring via SPDS. When a RED or ORANGE path status tree is observed, the SRO will designate one of the Board operators (typically the BOP) to verify status tree conditions using **1-FR-0, UNIT 1 STATUS TREES**. Once verified, the SRO should direct the crew to transition to the appropriate RED and/or ORANGE path procedure(s). During the progress of the LOCA, containment pressure will reach entry conditions for FR-Z.1, High Containment Pressure (>2.8 psig). Expected FR-Z-1 actions are included following E-1 event guide.
	SRO	Directs entry to E-1, Loss of Reactor or Secondary Coolant
Evaluator Note:		Once the loss of offsite power occurs (5 minutes following the reactor trip), crew members should include in their response POAs which will include verifying at least one 6.9 kV SHDN powered with an associated ERCW Pump , at least 1 CCP running
CRITICAL TASK	BOP	***Start at least 1 EDG prior to placing equipment PTL in ECA.0-0.*** **1A-A EDG started (following SI actuation), supplying 1A-A 6.9 kV Shutdown Board voltage.** (AOP-P.01, Loss of Offsite Power contains IOAs that should be performed in response to the loss of offsite power. AOP-P.01 actions are following this event guide.)
CRITICAL TASK	RO	***Start at least 1 CCP delivering hi-head injection via the CCPIT to RCS.*** ***Start 1A-A CCP*** (following loss of offsite power)
CRITICAL TASK	BOP	***Start at least 1 'A' Train ERCW Pump (J-A ERCW Pump) on an operating safeguards train*** (following loss of offsite power)
		E-1, LOSS OF REACTOR OR SECONDARY COOLANT
NOTE		This procedure has a foldout page.
	RO	1. **CHECK** RCP trip criteria:
		a. CHECK the following: • At least one CCP OR SI pump RUNNING **AND** • RCS pressure less than 1250 psig. b. **STOP** RCPs.

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Event Description: SI Termination

	BOP	d. **CHECK** containment hydrogen concentration less than 6%.
	BOP	e. **WHEN** ice condenser AHU breakers have been opened, **THEN** **ENERGIZE** hydrogen igniters **USING** Appendix D.
	BOP	f. **CHECK** containment hydrogen concentration less than 0.5%. [M-10]
	BOP	2. **CHECK** S/G secondary pressure boundaries INTACT: - S/G pressures CONTROLLED or RISING - S/G pressures greater than 140 psig.
	BOP	3. **MAINTAIN** Intact S/G narrow range levels:
		a. Greater than 10% [25% ADV].
		b. Between 10% [25% [ADV] and 50%
	BOP	4. **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.

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Event Description:	SI Termination						

		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	5. **MONITOR** pressurizer PORVs and block valves:
		a. Power to block valves AVAILABLE.
		b. Pressurizer PORVs CLOSED.
		c. At least one block valve OPEN.
	RO	6. **MONITOR** SI termination criteria:
		a. RCS subcooling based on core exit T/Cs greater than 40°F.
	BOP	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.
	RO	c. RCS pressure STABLE or RISING.
	RO	d. Pressurizer level greater than 10% [20% ADV].
Evaluator Note:	depending on crew pace to this step, transition criteria may exist. ES-1.1 follows E-1 in this guide.	
	SRO	e. **GO TO** ES-1.1, SI Termination.

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Event Description: SI Termination

	RO	7. **MONITOR** if containment spray should be stopped:
		a. **CHECK** any containment spray pump RUNNING.
		b. **CHECK** containment pressure less than 2.0 psig.
		c. **CHECK** containment spray suction aligned to RWST.
	RO	d. **RESET** containment spray signals. e. **STOP** containment spray pumps and **PLACE** in A-AUTO. f. **CLOSE** containment spray discharge valves: • FCV-72-39, Train A • FCV-72-2, Train B.
	BOP	8. **MONITOR** shutdown boards continuously energized.
	RO	9. **DETERMINE** if RHR pumps should be stopped:
		a. **CHECK** RCS pressure: 1) Greater than 300 psig 2) STABLE or RISING.
		b. **CHECK** RHR pump suction aligned from RWST.
		c. **ENSURE** SI signal RESET.
		d. **STOP** RHR pumps and **PLACE** in A-AUTO.
		e. **MONITOR** RCS pressure greater than 300 psig.

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Event Description: SI Termination

	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/SRO	10. **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.
	SRO	11. **DETERMINE** if \ 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.
	BOP	12. **MONITOR** if hydrogen igniters and recombiners should be turned on:
		a. **ENSURE** ice condenser AHU breakers opened **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.
		c. **CHECK** containment hydrogen concentration less than 6%.
		d. **WHEN** ice condenser AHU breakers have been opened, **THEN** **ENSURE** hydrogen igniters ENERGIZED **USING** Appendix D.

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Event Description: SI Termination

		e. **CHECK** containment hydrogen concentration less than 0.5%. [M-10]
	RO	13. **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.
	SRO	14. **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).
	BOP	b. **CHECK** Auxiliary Building radiation:
		1) Area Radiation Monitors RR–90–1A and RR–90–1B NORMAL.
		2) Aux Bldg Vent monitor recorder 0-RR-90-101 NORMAL (prior to isolation).

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Event Description: SI Termination

	RO	c. **MONITOR** containment sump level less than 68%.
	CREW	d. **NOTIFY** TSC to initiate post-accident sampling as necessary.
	BOP	e. **EVALUATE** plant equipment status **USING** EA-0-4, Evaluation of Equipment Status.
	SRO	15. **DETERMINE** if RCS cooldown and depressurization is required:
	RO	a. CHECK RCS pressure greater than 300 psig.
	SRO	b. GO TO ES-1.2, Post LOCA Cooldown and Depressurization.
	SRO	16. **DETERMINE** if transfer to cold leg recirculation is required:
	RO	a. CHECK RWST level less than 27%.
	SRO	b. IF ES-1.3 has NOT been performed, THEN GO TO ES-1.3, Transfer to RHR Containment Sump.
	RO	17. **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
		AND • RHR suction aligned to containment sump **AND** • At least one CCP **AND** one SI pump RUNNING.
	RO	b. CHECK both RHR pumps RUNNING.

	RO	c. **ESTABLISH** Train B RHR spray: 1) **CHECK** Train B RHR pump RUNNING. 2) **ENSURE** RHR crosstie FCV-74-35 CLOSED. 3) **CLOSE** RHR injection FCV-63-94. 4) **OPEN** RHR spray FCV-72-41.
	RO	d. **MONITOR** containment pressure greater than 4 psig.
	RO	18. **MONITOR** if CLAs should be isolated:
		a. **CHECK** RCS pressure less than 100 psig.
		b. **CHECK** power to CLA isolation valves AVAILABLE.
		c. **ENSURE** SI signal RESET.
		d. **CLOSE** CLA isolation valves.
	SRO	19. **INITIATE** evaluation of plant status:
	RO	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).

Op Test No.:	NRC 2010302	Scenario #	3	Event #	**ES-1.1**	Page	69 of 88
Event Description:	SI Termination						

	BOP	b. **CHECK** Auxiliary Building radiation: 1) Area Radiation Monitors RR–90–1A and RR–90–1B NORMAL. 2) Aux Bldg Vent monitor recorder 0-RR-90-101 NORMAL (prior to isolation).
	SRO	c. **CONSULT** TSC to determine dose projection for steaming S/Gs.
	SRO	d. **CHECK** dose projection for each S/G acceptable.
		e. **DUMP** steam to condenser from Intact S/Gs UNTIL S/G pressure less than RCS pressure.
	SRO	20. **DETERMINE** if reactor vessel head should be vented:
		• **CONSULT** TSC for evaluation of vessel head venting.
	SRO	21. **WHEN** 4 hours have elapsed since event initiation, **THEN PREPARE** for hot leg recirculation:
		• **DISPATCH** personnel to restore power to FCV-63-22 **USING** EA-201-1, 480V Board Room Breaker Alignments.
	SRO	22. **WHEN** 5 hours have elapsed since event initiation, **THEN GO TO** ES-1.4, Transfer to Hot Leg Recirculation.
	SRO	23. **EVALUATE** long term plant status:
		• **CONSULT** TSC.
		END

Scenario may be terminated upon transition to ES-1.1 Step 10.a

Op Test No.:	NRC 2010302	Scenario #	3	Event #	ES-1.1	Page	70 of 88
Event Description:	SI Termination						

Time	Position	Applicant's Actions or Behavior
ES-1.1, SI TERMINATION		
	NOTE: This procedure has a foldout page.	
	RO	1. **MONITOR** if containment spray should be stopped:
		a. **CHECK** any containment spray pump RUNNING.
		b. **CHECK** containment pressure less than 2.0 psig. ***(RNO reference)***
		RNO: b. **WHEN** containment pressure is less than 2.0 psig, **THEN PERFORM** remainder of Step 1.
		c. **CHECK** containment spray suction aligned to RWST.
		d. **RESET** containment spray signal.
		e. **ENSURE** containment spray pumps STOPPED in A-AUTO.
		f. **CLOSE** containment spray discharge valves FCV-72-2 and FCV-72-39.
	RO	2. **DETERMINE** if one cntmt spray pump should be stopped:
		a. **CHECK** BOTH cntmt spray pumps RUNNING
		b. **CHECK** any S/G faulted… **N/A** ***(RNO Required)***
		RNO: c. **GO TO** Step 3.
	RO	3. **RESET** SI signal.
	BOP	4. **MONITOR** shutdown boards continuously energized.
Evaluator Note: If off-site power loss occurred previous to reaching the following step, 1B-B CCP should be in P-T-L, not available since 1B-B EDG failed.		
	RO	5. **ENSURE** only one CCP RUNNING:
		a. **CHECK** offsite power supplying shutdown boards. ***(RNO Required)***
		RNO: a. **ENSURE** one CCP in PULL TO LOCK.
Evaluator Note: Depending on procedural pace, the crew may arrive at this step and determine to		

Op Test No.: NRC 2010302 Scenario # 3 Event # **ES-1.1** Page 71 of 88

Event Description: SI Termination

Time	Position	Applicant's Actions or Behavior
ES-1.1, SI TERMINATION		
transition to ES-1.2. If so, scenario may be terminated based on this transition determination (step 6 RNO determination).		
	RO	6. **CHECK** RCS pressure STABLE or RISING ***(RNO reference)***
	SRO	**RNO:** **ENSURE** pressurizer spray valves CLOSED. **IF** RCS pressure continues to drop, **THEN GO TO** ES-1.2, Post LOCA Cooldown and Depressurization.
		7. **ISOLATE** CCPIT:
		a. **CLOSE** CCPIT inlet valves FCV-63-39 and FCV-63-40.
		b. **CLOSE** CCPIT outlet valves FCV-63-25 and FCV-63-26.
		8. **ESTABLISH** charging flow:
		a. **CLOSE** seal water flow control valve FCV-62-89.
		b. **OPEN** charging isolation valves FCV-62-90 and FCV-62-91.
		c. **ENSURE** normal charging isolation valve FCV-62-86 OPEN.
		d. **ESTABLISH** desired charging flow **USING** seal water and charging flow control valves FCV-62-89 andFCV-62-93.
		9. **CONTROL** charging flow to maintain pressurizer level.
Evaluator Note: Depending on procedural pace, the crew may arrive at this step and determine to transition to ES-1.2. If so, scenario may be terminated based on this transition determination (step 10.a RNO determination)..		
		10. **DETERMINE** if SI pumps should be stopped:
		a. **CHECK** RCS pressure:
		• RCS pressure STABLE or RISING • RCS pressure greater than 1500 psig. ***(RNO reference)***
		RNO: a. **IF** NO S/G is Faulted, **THEN GO TO** ES-1.2, Post LOCA Cooldown and Depressurization.

Op Test No.:	NRC 2010302	Scenario #	3	Event #	FR-Z.1	Page	72	of 88
Event Description:	High Containment Pressure Function Restoration (Orange Path)							

Time	Position	Applicant's Actions or Behavior
		FR-Z-1, High Containment Pressure
	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	1. **MONITOR** RWST level greater than 27%.
	RO	2. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN • Panel 6L PHASE B GREEN.
	RO	3. **ENSURE** RCPs STOPPED
		4. **DETERMINE** if this procedure should be exited:
	BOP	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 Required)***
		RNO: a. **GO TO** Step 5.
	RO	b. **CHECK** containment pressure less than 12 psig.
	RO	c. **CHECK** at least one containment spray pump RUNNING and delivering flow.
	BOP	d. **CHECK** at least one containment air return fan RUNNING.
	SRO	e. **RETURN** to procedure and step in effect.
	RO	5. **VERIFY** containment spray operation:
		a. **CHECK** RHR sump recirculation capability AVAILABLE.
		b. **VERIFY** containment spray pumps RUNNING.
		c. **CHECK** RWST level greater than 27%.

Op Test No.:	NRC 2010302	Scenario #	3	Event #	FR-Z.1	Page	73	of 88
Event Description:	High Containment Pressure Function Restoration (Orange Path)							

Time	Position	Applicant's Actions or Behavior
		FR-Z-1, High Containment Pressure
	RO	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.
	BOP	6. **MONITOR** containment air return fans:
		• **WHEN** at least 10 minutes have elapsed from Phase B, **THEN** **ENSURE** containment air return fans RUNNING.
	RO	7. **VERIFY** containment ventilation dampers CLOSED:
		• Panel 6K CNTMT VENT GREEN • Panel 6L CNTMT VENT GREEN.
	RO	8. **VERIFY** Phase A valves CLOSED:
		• Panel 6K PHASE A GREEN • Panel 6L PHASE A GREEN.
	RO	9. **VERIFY** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL]
		• FCV-30-46 • FCV-30-47 • FCV-30-48.

Op Test No.: NRC 2010302 Scenario # 3 Event # FR-Z.1 Page 74 of 88

Event Description: High Containment Pressure Function Restoration (Orange Path)

Time	Position	Applicant's Actions or Behavior
		FR-Z-1, High Containment Pressure
	RO/BOP	10. **VERIFY** MSIVs and MSIV bypass valves CLOSED.
	RO/BOP	11. **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.	
	RO/BOP	12. **DETERMINE** if any S/G Faulted:
		a. **CHECK** S/G pressures:
		• Any S/G pressure DROPPING in an uncontrolled manner **OR** • Any S/G pressure less than 140 psig.
	BOP	b. **ISOLATE** feed flow to affected S/G:
		• MFW • AFW
	BOP	13. **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.
		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.

Op Test No.:	NRC 2010302	Scenario #	3	Event #	FR-Z.1	Page	75 of 88
Event Description:	High Containment Pressure Function Restoration (Orange Path)						

Time	Position	Applicant's Actions or Behavior
		FR-Z-1, High Containment Pressure
		e. **CHECK** containment hydrogen concentration less than 0.5%.
	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 **AND** • RHR suction ALIGNED to containment sump **AND** • At least one CCP **AND** one SI pump RUNNING.
	RO	b. **CHECK** both RHR pumps RUNNING.
	RO	c. **ESTABLISH** Train B RHR spray:
		1) **CHECK** Train B RHR pump RUNNING.
		2) **ENSURE** RHR crosstie FCV-74-35 CLOSED.
		3) **CLOSE** RHR injection FCV-63-94.
		4) **OPEN** RHR spray FCV-72-41.
	RO	d. **MONITOR** containment pressure greater than 4 psig.
	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.
		c. **CHECK** containment spray suction aligned to RWST.
		d. **RESET** Containment Spray.
		e. **STOP** containment spray pumps and **PLACE** in A-AUTO.

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Event Description: High Containment Pressure Function Restoration (Orange Path)

Time	Position	Applicant's Actions or Behavior
		FR-Z-1, High Containment Pressure
	RO	f. **CLOSE** containment spray discharge valves:
		• FCV-72-39, Train A • FCV-72-2, Train B.
	SRO	16. **RETURN TO** procedure and step in effect.
		END

Op Test No.:	NRC 2010302	Scenario #	3	Event #	ES-0.5	Page	77 of 88
Event Description:	**ES-0.5, Equipment Verifications**						

Time	Position	Applicant's Actions or Behavior
ECA-0.0, Loss Of All AC Power		
CRITICAL TASK	BOP	***Start at least 1 EDG prior to placing equipment PTL in ECA.0-0*** **1A-A EDG started, supplying 1A-A 6.9 kV Shutdown Board voltage.**
CRITICAL TASK	RO	***Start at least 1 CCP (high-head injection pump)*** ***1A-A CCP started delivering hi-head injection via the CCPIT to RCS.***
CRITICAL TASK	BOP	***Start at least 1 'A' Train ERCW Pump in an operating safeguards train***
Evaluator Note:		Following SI actuation, both EDGs will fail to start. BOP Operator is expected to manually start 1A-A EDG from either 1-M-1 using 1-HS-82-15, DG EMERG START 1A-A, 2A-A, 1B-B, 2B-B handswitch or back panel 0-M-26A using emergency start pushbutton 0-HS-82-16A and start at least 1 'A' Train ERCW Pump (J-A ERCW Pump should be the U1 A Train pump started).
	NOTE: Steps 1, 2, and 3 are immediate action steps.	
	SRO	1. **SUSPEND** FRP implementation and **MONITOR** status trees for information only.
	RO	2. **VERIFY** reactor TRIPPED:
		• ▪ Reactor trip breakers OPEN • ▪ Reactor trip bypass breakers OPEN or DISCONNECTED • ▪ Neutron flux DROPPING
	BOP	3. **VERIFY** turbine TRIPPED: • ALL turbine stop valves CLOSED [SSPS status lights on M-6].
	RO	4. **ENSURE** RCPs STOPPED.
	NOTE: Step 5 should be handed off to a Unit Operator.	
		5. **PERFORM** the following notifications:
	BOP	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.
	BOP	b. **NOTIFY** Site Security to station officers at key vital doors **USING** SSI-1, Security Instructions for Members of the Security Force.
	RO	6. **CHECK** RCS ISOLATED:
		a. Pressurizer PORVs CLOSED.

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Event Description: **ES-0.5, Equipment Verifications**

Time	**Position**	**Applicant's Actions or Behavior**
ECA-0.0, Loss Of All AC Power		
		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.	
	BOP	7. **MONITOR** AFW flow:
		a. **CHECK** TD AFW pump RUNNING.
		b. **CONTROL** TD AFW pump **USING** EA-3-1, MCR Operation of TD AFW Pump.
		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%.

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Event Description: **ES-0.5, Equipment Verifications**

Time	Position	Applicant's Actions or Behavior
		ECA-0.0, Loss Of All AC Power
	CAUTION:	**DO NOT attempt to start D/Gs if both trains of ERCW are unavailable due to catastrophic event.**
CRITICAL TASK	BOP	***Start at least 1 EDG prior to placing equipment PTL in ECA.0-0*** **1A-A EDG started, supplying 1A-A 6.9 kV Shutdown Board voltage.**
CRITICAL TASK	BOP	***Start at least 1 'A' Train ERCW Pump in an operating safeguards train***
	BOP	8. **ATTEMPT** to restore power to any shutdown board on this unit:
		a. **RESET** D/G start lockout relays. [0-M-26]
CRITICAL TASK		**b. EMERGENCY START diesel generators. [M-1 switch and M-26 pushbutton]**
CRITICAL TASK		**c. VERIFY at least one shutdown board ENERGIZED from D/G on this unit.**
CRITICAL TASK		**d. VERIFY ERCW supply to running diesel generators.**
CRITICAL TASK		**e. CHECK at least one shutdown board on this unit ENERGIZED.**
	SRO	f. **RESUME** FRP implementation.
	SRO	g. **RETURN TO** procedure and step in effect.
		END

Op Test No.: NRC 2010302 Scenario # 3 Event # AOP-P.01 Page 80 of 88

Event Description: **Loss of Off Site Power**

Time	Position	Applicant's Actions or Behavior

AOP-P.01, Loss of Off Site Power

Evaluator Note: During AOP-P.01 implementation, the crew performs through step 9, which contains actions important to support current operating strategies; further activities, while important, are administrative or are delegated to Unit 2 MCR or other plant personnel outside the MCR.

Time	Position	Applicant's Actions or Behavior
		2.0 OPERATOR ACTIONS
	CREW	1. **DIAGNOSE** the failure:

IF...	GO TO SECTION	PAGE
Complete loss of off-site power	2.1	4
Partial Loss of Offsite Power: • A or B start busses de-energized OR • loss of normal supply to individual shutdown board (shutdown board energized from D/G)	2.2	29

Time	Position	Applicant's Actions or Behavior
		2.1 Complete Loss of Offsite Power
		NOTE: Steps 1 and 2 are immediate actions.
CRITICAL TASK		***Start at least 1 EDG prior to placing equipment PTL in ECA.0-0.*** **1A-A EDG started, supplying 1A-A 6.9 kV Shutdown Board voltage.**
	BOP	1. **CHECK** Diesel Generators RUNNING and supplying shutdown boards. ***(RNO Required)***
	BOP	**RNO:** **EMERGENCY START** available D/Gs. (From 1-M-1 Handswitch or 0-M26-A Emergency Start PB)
	BOP	2. **CHECK** ERCW supply valves to D/Gs OPEN.

Evaluator Note: AOP-P.01 as well as E-0, ECA-0.0 and ES-0.5 verifies 6.9 kV Shutdown Board voltage; these procedures implement actions to restore shutdown board voltage. Several procedures provide these instructions giving the operators multiple prompts to continue actions to restore voltage to at least one 6.9 kV Shutdown Board.

Op Test No.: NRC 2010302 Scenario # 3 Event # AOP-P.01 Page 81 of 88

Event Description: **Loss of Off Site Power**

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
Critical Task:		**Start 1A-A EDG, to supply 1A-A 6.9 kV Shutdown Board voltage.**
	BOP	3. **MONITOR** BOTH 6900V shutdown boards on this unit ENERGIZED. ***(RNO Required)***
	BOP	**RNO:** **IF** NO 6900V shutdown board is ENERGIZED on this unit, **THEN PERFORM** the following:
		a. **IF** unit is in Mode 1-4, **THEN ENSURE** ECA-0.0, Loss of All AC Power has been entered.
		b. **IF** unit is in Modes 5 or 6…this Step is N/A
Critical Task		c. **IF any D/G is available…1A-A EDG should be started**
	BOP	d. **WHEN** off-site power is available…will not be restored this scenario
		e. **DO NOT CONTINUE** Section 2.1 UNTIL at least one shutdown board is ENERGIZED.
	BOP	**IF** one 6900V shutdown board is ENERGIZED on this unit, **THEN PERFORM** the following:
CRITICAL TASK	RO	***Start at least 1 CCP (high-head injection pump)*** ***1A-A CCP started delivering hi-head injection via the CCPIT to RCS.***
		a. **ENSURE** available **CCP RUNNING**.
	RO	b. **IF** NO CCP is available…1A-A CCP in service- step N/A
	BOP	c. **IF** any D/G available…1A-A EDG in service- step N/A
	BOP	d. **PERFORM** applicable AOP for loss of shutdown board as time allows:
		• AOP-P.05 (Unit 1 Shutdown Boards) • AOP-P.06 (Unit 2 Shutdown Boards)

Op Test No.: NRC 2010302 Scenario # 3 Event # AOP-P.01 Page 82 of 88

Event Description: **Loss of Off Site Power**

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
	BOP	e. **IF** off-site power is available…N/A for remainder of scenario
		4. **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.
		5. **RECORD** time of loss of off-site power.__________
		6. **MONITOR** diesel generator loading:
		7. **CHECK** charging system operation:
	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	**Opening Train A ERCW supply to Station Air Compressors with ERCW temp greater than 82.3°F makes Train A MCR Chiller and EBR Chiller inoperable due to inadequate ERCW flow. This would place both units in LCO 3.0.5.**
	NOTE	Starting control air compressors will add about 0.1 MW to D/G 1A-A and 1B-B.
		8. **RESTORE** control air:
		a. **PLACE** MSIV handswitches in CLOSE position.

Op Test No.: NRC 2010302 Scenario # 3 Event # AOP-P.01 Page 83 of 88

Event Description: **Loss of Off Site Power**

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
		b. **ESTABLISH** cooling water to station air compressors:
		1) **VERIFY** Train B ERCW available. 2) **ENSURE** FCV-67-208 Train B ERCW to air compressors OPEN. [0-M-27A]
		c. **WHEN** ERCW established to station air compressors, **THEN 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] (powered from Unit 2 Shutdown Bds)
		e. **CHECK** Phase B NOT actuated.
		f. **WHEN** control air pressure restored, **THEN RESTORE** air to containment **USING** EA-32-1, Establishing Control Air to Containment.
		9. **DISPATCH** operator to D/G Building to monitor diesel generators **USING** 0-SO-82-1, 2, 3, 4 App. C.

Evaluator Note: During AOP-P.01 implementation, the crew performs through step 9, which contains actions important to support current operating strategies; further activities, while important, are administrative or are delegated to Unit 2 MCR or other plant personnel outside the MCR.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	ECA-0.0	Page	84 of 88
Event Description:	Loss of All AC Power						

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
Evaluator Note:		During AOP-P.01 implementation, the crew performs through step 9, which contains actions important to support current operating strategies; further activities, while important, are administrative or are delegated to Unit 2 MCR or other plant personnel outside the MCR.
		2.0 OPERATOR ACTIONS
	CREW	2. **DIAGNOSE** the failure:

IF...	GO TO SECTION	PAGE
Complete loss of off-site power	2.1	4
Partial Loss of Offsite Power: • A or B start busses de-energized OR • loss of normal supply to individual shutdown board (shutdown board energized from D/G)	2.2	29

Time	Position	Applicant's Actions or Behavior
		2.1 Complete Loss of Offsite Power
		NOTE: Steps 1 and 2 are immediate actions.
CRITICAL TASK		***Start at least 1 EDG prior to placing equipment PTL in ECA.0-0.*** **1A-A EDG started, supplying 1A-A 6.9 kV Shutdown Board voltage.**
	BOP	10. **CHECK** Diesel Generators RUNNING and supplying shutdown boards. ***(RNO Required)***
	BOP	**RNO:** **EMERGENCY START** available D/Gs. (From 1-M-1 Handswitch or 0-M26-A Emergency Start PB)
	BOP	11. **CHECK** ERCW supply valves to D/Gs OPEN.
Evaluator Note:		AOP-P.01 as well as E-0, ECA-0.0 and ES-0.5 verifies 6.9 kV Shutdown Board voltage; these procedures implement actions to restore shutdown board voltage. Several procedures provide these instructions giving the operators multiple prompts to continue actions to restore voltage to at least one 6.9 kV Shutdown Board.

Op Test No.: NRC 2010302   Scenario # 1   Event # ECA-0.0   Page 85 of 88

Event Description: Loss of All AC Power

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
Critical Task:		**Start 1A-A EDG, to supply 1A-A 6.9 kV Shutdown Board voltage.**
	BOP	12. **MONITOR** BOTH 6900V shutdown boards on this unit ENERGIZED. ***(RNO Required)***
	BOP	**RNO:** **IF** NO 6900V shutdown board is ENERGIZED on this unit, **THEN PERFORM** the following:
		f. **IF** unit is in Mode 1-4, **THEN ENSURE** ECA-0.0, Loss of All AC Power has been entered.
		g. **IF** unit is in Modes 5 or 6…this Step is N/A
Critical Task		h. **IF any D/G is available…1A-A EDG should be started**
	BOP	i. **WHEN** off-site power is available…will not be restored this scenario
		j. **DO NOT CONTINUE** Section 2.1 UNTIL at least one shutdown board is ENERGIZED.
	BOP	**IF** one 6900V shutdown board is ENERGIZED on this unit, **THEN PERFORM** the following:
CRITICAL TASK	RO	***Start at least 1 CCP (high-head injection pump)*** ***1A-A CCP started delivering hi-head injection via the CCPIT to RCS.***
		f. **ENSURE** available **CCP RUNNING**.
	RO	g. **IF** NO CCP is available…1A-A CCP in service- step N/A
	BOP	h. **IF** any D/G available…1A-A EDG in service- step N/A
	BOP	i. **PERFORM** applicable AOP for loss of shutdown board as time allows:
		- AOP-P.05 (Unit 1 Shutdown Boards) - AOP-P.06 (Unit 2 Shutdown Boards)

Op Test No.:	NRC 2010302	Scenario #	1	Event #	ECA-0.0	Page	86	of	88
Event Description:	Loss of All AC Power								

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
	BOP	j. **IF** off-site power is available…N/A for remainder of scenario
		13. **NOTIFY** SM to perform the following:
		c. **EVALUATE** EPIP-1, Emergency Plan Classification Matrix.
		d. **INITIATE** staffing of TSC and OSC **USING** Emergency Paging System.
		14. **RECORD** time of loss of off-site power._________
		15. **MONITOR** diesel generator loading:
		16. **CHECK** charging system operation:
	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	**Opening <u>Train A</u> ERCW supply to Station Air Compressors with ERCW temp greater than 82.3°F makes <u>Train A</u> MCR Chiller and EBR Chiller inoperable due to inadequate ERCW flow. This would place both units in LCO 3.0.5.**
	NOTE	Starting control air compressors will add about 0.1 MW to D/G 1A-A and 1B-B.
		17. **RESTORE** control air:
		g. **PLACE** MSIV handswitches in CLOSE position.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	ECA-0.0	Page	87	of 88
Event Description:	Loss of All AC Power							

Time	Position	Applicant's Actions or Behavior
		AOP-P.01, Loss of Off Site Power
		h. **ESTABLISH** cooling water to station air compressors:
		1) **VERIFY** Train B ERCW available. 2) **ENSURE** FCV-67-208 Train B ERCW to air compressors OPEN. [0-M-27A]
		i. **WHEN** ERCW established to station air compressors, **THEN DISPATCH** an operator to start Station Air Compressors A and B **USING** EA-32-2, Establishing Control and Service Air.
		j. **ENSURE** auxiliary air compressors RUNNING. [M-15 or AB el 734] (powered from Unit 2 Shutdown Bds)
		k. **CHECK** Phase B NOT actuated.
		l. **WHEN** control air pressure restored, **THEN RESTORE** air to containment **USING** EA-32-1, Establishing Control Air to Containment.
		18. **DISPATCH** operator to D/G Building to monitor diesel generators **USING** 0-SO-82-1, 2, 3, 4 App. C.

Evaluator Note: During AOP-P.01 implementation, the crew performs through step 9, which contains actions important to support current operating strategies; further activities, while important, are administrative or are delegated to Unit 2 MCR or other plant personnel outside the MCR.

Op Test No.:	NRC 2010302	Scenario #	1	Event #	Critical Task(s)	Page	88	of	88
Event Description:	Critical Task Listing								

Critical Tasks:	Critical Task Statement	Action Location	ESG pg #
1.	Start at least 1 EDG prior to placing equipment PTL in ECA.0-0	E-0 to E-1 transition	61
		ES-0.5 Step 1	78
		ECA-0.0 Step 8.a-c	79
		AOP-P.01 step 3.c	80
2.	Start at least 1 CCP (high-head injection pump)	E-0 to E-1 transition	61
		ES-0.5 Step 11.a	77
		AOP-P.01 step 3.c	81
3.	Start at least 1 'A' Train ERCW Pump in an operating safeguards train	E-0 to E-1 transition	61
		ECA-0.0 Step 8.d	79
		ES-0.5 Step 3	77

Facility: Sequoyah Scenario No.: 4 Op Test No.: 2010302

Examiners: ____________ Operators: ____________

Initial Conditions: 100% Power BOL; TD AFW Pp OOS for maintenance

Turnover: Maintain Current Plant conditions

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

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

Equalize pressure between RCS and ruptured SG to stop primary to secondary leakage. (Time critical action)

Terminate RCS depressurization prior to losing RCS Subcooling

Event #	Malf. No.	Event Type*	Event Description
1. T+0	CC14 CC20	C – BOP TS – SRO	Component Cooling Line Break (within make-up capacity) Make-up valve 1-FCV-70-63 fails to open automatically
2. T+20	RX11B	I – RO TS – SRO	1-PT-1-73, Main Turbine Impulse Pressure Transmitter fails low
3. T+30	ZAITIC2448	C – BOP*	Gen H2 Temp Hx Cooling Water Controller failure
4. T+35	TH05A	C – All TS – SRO	SGTL
5. T+50	N/A	R – RO N – SRO/BOP	Rapid plant shutdown
6. T+50	ZDIHS62138A	C – RO C – SRO	Rapid Boration Valve fails to open; RWST use for rapid shutdown
7. T+50	TH05A	M – All	SGTL increases to SGTR requiring Rx Trip and Safety Injection
8. T+50	MS04A	C – BOP	#1 SG MSIV Auto/Manual close failure
9. T+60	RC06A RC06B	C – RO	Both Pzr Spray Valves fail full open during RCS depressurization in E-3

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

Scenario 4 Summary

The crew will assume the shift with the unit at 100% Power BOL and the TD AFW Pump OOS for maintenance with the directions to maintain 100% RTP per 0-GO-5 Section 5.2.

At the Lead Examiner direction, initiate the next event, a Component Cooling System leak occurs within the capacity of make-up however, the make-up flow control valve, 1-FCV-70-63 fails to open automatically requiring the operator action. Crew will respond by using ARPs 0-AR-M27B-B C-2, C-3 and, as necessary, AOP-M-03, Loss of Component Cooling Water, Section 2.4 to stabilize CCS inventory while continuing to identify the leak, which is outside containment. SRO will identify Tech Specs: 3.5.2, 3.6.2.1, 3.7.3.

When CCS Surge Tank conditions are stable and at the direction of the Lead Examiner, Turbine Impulse Transmitter PT-1-73 will fail low. This will result in inadvertent rod insertion. The crew will respond using alarm response procedure (ARPs) 1-AR-M5-A A-6 and abnormal procedure AOP-C.01, Rod Control Malfunctions Section 2.1, Uncontrolled Rod Bank Movement to place Rod Control in Manual. AOP-C.01 Section 2.1 transitions the crew to AOP-I.08 Section 2.1, Failure of 1-PI-1-73, to evaluate actual S/G levels vs. level program, Feedwater Control and direct transfer steam dump control system to steam pressure mode. SRO will refer to Tech Specs: 3.3.1.1 Functional Unit 22E, Action 8.b.

Following TS identification, at Lead Examiner direction, initiate the next event, Main Generator (MG) high hydrogen gas temperatures due to Hydrogen Cooling RCW TCV failing. The crew will respond to ICS and determine that the H2 cooling water valve, 1-TIC-24-48 is not functioning in AUTOMATIC; the operators will take manual control and attempt to restore H2 temperature. The H2 TIC will remain in MANUAL control for the remainder of the scenario.

Following the MG high hydrogen cooling failure, at the direction of the Lead Examiner, a Steam Generator Tube Leak (SGTL) approximately 15 gpm, occurs in #1 Steam Generator (SG). The crew will respond using ARPs 0-AR-M12-A B-5, C-1 and go to AOP-R.01, SG Tube Leak Section 2.1 initially. SRO will refer to Tech Specs: 3.4.6.2.c Action a.

Since this leak is within normal charging capacity, AOP-R.01 directs the crew to perform a rapid shutdown according to AOP-C.03, Rapid Shutdown or Load Reduction. During initiation of the rapid load reduction, 1-FCV-62-138, Emergency Boration Flow Control Valve fails to open (from the MCR and locally) resulting in the crew using either normal makeup boration or boration from the RWST. From Event 3, Rod Control remains in MANIUAL.

After the rapid shutdown is initiated, at the direction of the Lead Examiner, the SGTL will propagate to a significant rupture (~400 gpm). This leak size will require Reactor Trip/Safety Injection initiation.

After the crew initiates the Reactor Trip/SI, the ruptured S/G MSIV will not close. E-3, SGTR requires closing non-ruptured MSIVs and other steam paths both from the MCR and locally to isolate the ruptured S/G. #1 S/G MSIV will close when EA-1-1, Closing MSIVs Locally, E-3 alternate path actions, is implemented.

As the crew progresses through E-3, they will cool down and depressurize the RCS to the identified target values. During depressurization, both Pressurizer Spray Valves will fail open requiring the crew to stop at least #1 and #2 RCPs to control the RCS depressurization.

EOP flow: E-0 – E-3

Scenario Termination: as directed by the Lead Examiner following completion of RCS depressurization and CCPIT isolation in E-3 Step 24.

PSA significant task: Manual MSIV Closure; SGTL Leak determination
PSA significant DAS: SGTR
PSA significant component failure: SG Tube failure; #1 MSIV closure; Pzr Spray Valve Control

NRC 1009 ESG-4 Booth Instruction File

8/16/2010

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
Simulator IC	**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:** **1009 NRC ESG-4** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms	**100%, BOL ~150 MWD/MTU** **CB 'D' Rods @ 216 steps, all others @ 228 steps; [B] = 1120 ppm; Ba Blender setting: 27.5%** **Xe/Sm @ *equilibrium*** ***Console Operator actions: Place simulator in run and perform the following:*** • **Allow the simulator to run before loading SCEN file.** • **Place the MODE 1 sign on 1-M-4** • **Place Train Week A sign**
MFs, RFs, ORs are active when the SCN file is loaded.	IMF FW07C f:1 IOR ZLOHS151A_GREEN f:0 IOR ZLOHS117A_GREEN f:0 IOR ZLOHS118A_GREEN f:0 IOR ZLOHS3136AA_GREEN1 f:0 IOR ZLOHS3136AA_GREEN2 f:0 IOR ZLOHS3136AA_RED1 f:0 IOR ZLOHS3136AA_RED2 f:0 IOR ZDIHS3136AA f:0 IOR ZLOHS3179AA_GREEN1 f:0 IOR ZLOHS3179AA_GREEN2 f:0 IOR ZLOHS3179AA_RED1 f:0 IOR ZLOHS3179AA_RED2 f:0 IOR ZDIHS3179AA f:0	**TDAFW PUMP IS INOPERABLE.** *Close FCV-1-17 & 18 & place Hold Notice on HS-1-17&18 and FCV-1-51.* *Also place Hold Order on TDAFW Pump ERCW supply valves.* *Place Protected Equipment tags on both MD AFW Pumps, 1-M-4 and both EDGs, 0-M-26*
Event 1.: insert using **Key 1**	**IMF CC20 f:1 k:1** **IMF CC14 f:32 k:1**	**1-FCV-70-63 fails to open automatically** **Component Cooling Line Break- C-S Pp Disch Hdr** (within make-up capacity) *Support staff: If requested, report **U2** make-up is in progress as expected.*
	IRF CCR15 f:1 k:11	**Demin Head Tank Make-up @ ~400 gpm** *Support staff: if dispatched to respond 1-AR-M15-B, E-3, wait 2 minutes insert k: 13 and report DI Head Tank make-up is in progress.*

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
When Appx B performance requested,	**IMF AN_OV_604 f:2 k:21**	1-XA-55-M6-E A-4, *"480V REAC MOV BD 1B1-B/1B2-B TRANSFER SWITCH IN AUX MODE"*: Any mode selector switch on Reactor MOV Bd 1B1-B or 1B2-B in 'Auxiliary' position. *<u>Support staff:</u> When dispatched, wait 1 minute, insert k:23 and report as AUO, Appendix B valves transferred to 'AUXILIARY", standing by.* *<u>Support staff:</u> When directed by the MCR staff, insert k:33 to sequentially close specified valves; report as AUO valves are positioned to 'CLOSE'.* *<u>Support staff:</u> If requested, report as AB AUO water flow from CCS piping break subsiding.*
When MCR staff directs,	**IRF CCRV12 f:0 k:31** **IRF CCRV75 f:0 d:5 k:31** **IRF CCR2V75 f:0 d:10 k:31**	**Closes the following Appendix B Valves:** **1-FCV-70-12, CCS HX 0B1 and 0B2 Outlet** **1-FCV-70-75- U1 B-Trn to C-S Pump.** **2-FCV-70-75- U2 B-Trn to C-S Pump.**
INSTRUCTOR NOTE: delete AN_OV_604 when directed by the MCR staff to remove power from Appx. B Valves.		
		<u>Support staff:</u> If dispatched, wait ~2 minutes, report as the AB AUO, water on the floor around the CC Hxs on AB El. 714' and running down the stairs; location appears to be on the common inlet to the 0B1/0B2 CCS Hx. *If requested to check the Flood Mode Pnl, report LS-40-54, 55 @714'3" increasing;* *If requested to TB 685'local panel, report LS-59-180A/B Demin Water Storage Tank level low is the cause*
Event 2.: insert using **<u>Key 2</u>**	**IMF RX11B f:0 k:2**	**Impulse Pressure Transmitter 1-PT-1-73 Fails Low** *<u>Support staff report</u>: When IMs or MSS contacted to trip bistables, inform the crew that the IMs will report to the MCR in ~ 45 minutes.*
Event 3.: insert using **<u>Key 3</u>**	**IOR ZAITIC2448 f:1 k:3**	**Gen H2 Temp Hx Cooling Water Controller failure** *<u>Support staff:</u> if dispatched, TB AUO reports no apparent, visible cause for malf.*
Event 4.: insert using **<u>Key 4</u>**	**IMF TH05A f:0.3 k:4**	**#1 SGTL ~15 gpm & Rapid Plant Shutdown** *<u>Support staff report</u>: When Chem Lab contacted for RM-90-119 limit, inform the crew of the limit on the Ops chemistry information report (turnover information). Report that other Chemistry actions will take ~45 minutes to complete.* *<u>Support staff report</u>: When RADCON/Chem Lab are requested to survey/sample S/Gs, wait ~10 min then report as RADCON that #1 S/G has slightly higher background than the others.* *<u>Support staff report</u>: Wait 45 minutes and report as Chem Lab that ruptured S/G is #1 S/G.*

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
Event 5.	**- none -**	AOP-C.03 Rapid Plant Shutdown *Support staff report: as necessary to support plant power reduction.*
Event 6.	**IOR ZDIHS62138A f:0 d:5** **[pre-insert]**	Emergency Boration Flow Control Valve (FCV-62-138) fails closed after starting open. *Support staff report: If Dispatched to check locally wait~ 3 min and report valve closed but you cannot determine why it won't open. If requested to operate the valve locally, report that it will not open locally either.*
Event 7. **Modify** Malfunction	**MMF TH05A f:8.6 r:300**	**Lp 1 SGTL Increasing To SGTR (~400 Gpm) Over 5 Min. (Rx Trip/Safety Injection required)** *Support staff report: - none -*
Event 8. **KEY-18**	**IMF MS04A f:1** **[pre-insert]** **IOR AN_OV_610 f:2 k:18** **IOR AN_OV_617 f:2 d:5 k:18** **IRF MSR04A f:1 d:10 k:18** **AND** **DMF MS04A w/ k:18**	**#1 SG MSIV Auto/Manual close failure** *Support staff report: When directed to perform EA-1-1, wait 1 minute and report #1 SG MSIV transfer switch in the AUX position.* ***THEN, Insert KEY 18***
Event 9.: Insert during E-3 RCS Depress **Key 9**	**IMF RC06A f:100 k:9** **IMF RC06B f:100 k:9**	**BOTH Pzr Spray Valves PCV-68-340B & 68-340D Fail Open** *Support staff report: -none-*

Termination Criteria: completion of E-3 Step 24, CCPIT Isolation

Unit 1 MCR CHECKLIST Page 1. of 3 Today

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

Mode 1, 100% Power **PSA Risk: YELLOW** **Grid Risk: Green** **RCS Leakage ID .02 gpm, UNID .02 gpm**	**NRC phone Authentication Code** **Until 0800 XXXX** **After 0800 YYYY**

Common Tech Spec Actions

- **None**

U-1 Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner
TS LCO 3.7.1.2.a	TDAFW T&T valve repair	2 hours ago	MMG
TS 3.3.3.7.18b action 1	TDAFWP ERCW - AFW Valve Position	2 hours ago	MMG

Protected Equipment

- Equipment/spaces for TDAFW Pump per 0-GO-16 Appx J

Shift Priorities

- 100% RTP in accordance with 0-GO-5 Section 5.2, power Operation
- Daily and Shiftly SIs per work schedule

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

SHIFT TURNOVER CHECKLIST Page 2. of 3 Today

MAIN CONTROL ROOM (7690)

- **Train _A_ Week**
- Protected Equipment:
  - MDAFW Pump A 1-HS-3-118A
  - MDAFW Pump B 1-HS-3-128A
  - D/G 1A-A 1-HS-57-46A
  - D/G 1B-B 1-HS-57-73A

OUTSIDE (7666) [593-5214]

- ***All Equipment normal***
- ***Equipment/spaces for TDAFWP protected per 0-GO-16 Appx J***

AUXILIARY BUILDING (7775)

- ***TDAFW pump was tagged 2 hours ago for repair to the T&T valve. The packing was blowing excessively. Expected Return to service is 8 hours. (WO 10-080025-000)***

TURBINE BUILDING (7771) (593-8455)

- ***All Equipment normal***

SHIFT TURNOVER CHECKLIST Page 3. of 3 Today

Disabled Annunciators

PANEL	WINDOW	ANNUNCIATOR	WO / PER Number

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number

MCR WO LIST

ID And Noun Name	Panel	Problem Description	WO/PER Number

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1120** ppm Today		BA Controller Setpoint: **27.5%** *	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 189: **17** gallons of acid, **75** 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: **22**	Gallons of water: **94**	Rod Steps: **1**

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%	181 Steps on bank D	93 gallons
30%	161 Steps on bank D	291 gallons
50%	n/a	n/a

** 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 TODAY. Data Valid up to three weeks from now.

Previous Shift Reactivity Manipulations

Number of dilutions: 1	Number of borations:	Rod steps in:
Gallons per dilution: 12	Gallons per boration:	Rod steps out:
Total amount diluted: 12	Total amount borated:	Net change: IN/Out

Current Shift Estimated Reactivity Manipulations

Remarks: Rx Power – 100% MWD/MTU – 1000 Xenon & Samarium at Equilibrium
***The boron letdown curve is flat for the next 25 EFPD.

Last Dilution Complete ~1 hour ago.

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

Unit Supervisor: ______________________
Name/Date

Operations Chemistry Information

Boron Results

Sample Point	Units	Boron	Date / Time	Goal	Limit
U1 RCS	ppm	1120	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	ppm	1.1	Today / Now	>1	>1
U2 RCS	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	115	Today / Now	68	Today / Now
15 gpd (30 min increase)	cpm	265	Today / Now	83	Today / Now
30 gpd leak equivalent	cpm	490	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	1165	Today / Now	455	Today / Now
150 gpd leak equivalent	cpm	2290	Today / Now	870	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cfm	40	Today / Now	40	Today / Now

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

Op Test No.:	NRC 2010302	Scenario #	4	Event #	1	Page	1 of 44

Event Description: Component Cooling Line Break (within make-up capacity)
Make-up valve 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior

Simulator Operator: When directed, initiate Event 1

Indications/Alarms

Annunciator:
0-M-27B

- **0-XA-55-27B-B C-2, “UNIT 1 CCS SURGE TANK LEVEL ABNORMAL”**
  D-2, “UNIT 1 CCS CURGE TK LVL LO AUTO MAKEUP INITIATED”
- **0-XA-55-27B-D C-2, “UNIT 2 CCS SURGE TANK LEVEL ABNORMAL”**
  D-2, “UNIT 2 CCS CURGE TK LVL LO AUTO MAKEUP INITIATED”

Indications

- **1-LI-70-99A CCS SURGE TK A OUTLET LEVEL (“B” Header) indicates a lowering level**
- **1-LI-70-63A CCS SURGE TK A INLET LEVEL (“A” Header) indicates a lowering level**
- **2-LI-70-99A CCS SURGE TK A OUTLET LEVEL indicates a lowering level**
- **2-LI-70-63A CCS SURGE TK A INLET LEVEL indicates a lowering level**

Significant Resultant Alarms/Indications:

Annunciator:

- **1-XA-55-15 D-3, “TURB AUX OR REAC BLDG FLOODED”**
- **E-3, “LS-59-180A/B DEM WTR AND CASK DECON SYS ABN CONDITION”**

Time	Position	Applicant's Actions or Behavior
T + 0	BOP	Respond to 0-M-27 alarms in accordance with Alarm Response Procedures

Evaluator Note: 0-M-27 Panel alarms from **both units** will actuate due to the common Component Cooling Water System operating alignment. If the BOP responds to **U2** surge tank level and make-up alarms, expected make-up to the **U2** surge tank is operating as expected. Prompts to be provided by the Simulator operator if contacted for **U2** indications not available on Simulator Panel 0-M-27.

Time	Position	Applicant's Actions or Behavior
	BOP	**From 0-AR-M27B-B C-2, BOP will inform SRO:** **[3] IF** surge tank level is low, **THEN** **[a] DISPATCH** operator to investigate problem.
	SRO	**[b] IF** sufficient level cannot be maintained, **THEN** **GO TO** AOP-M.03, *Loss of Component Cooling Water.*

Op Test No.: NRC 2010302 Scenario # 4 Event # 1 Page 2 of 44

Event Description: Component Cooling Line Break (within make-up capacity)
Make-up valve 1-FCV-70-63 fails to open automatically

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td>BOP</td><td>From 0-AR-M27B-B D-2, BOP will inform SRO:
[1] CHECK surge tank level by observing [1-LI-70-63A].</td></tr>
<tr><td></td><td>BOP</td><td>[2] VERIFY 1-LCV-70-63 OPEN.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Evaluator Note: BOP identifies U1 make-up valve 1-FCV-70-63 failed to open automatically (GREEN light lit, RED light dark), notifies SRO and opens valve using handswitch 1-HS-70-63 at 0-M-27B.</td></tr>
<tr><td colspan="3">Evaluator Note: SRO/BOP identifies CCS Surge Tank level stabilizing/level returning to normal; determines make-up controlled to maintain level.
Refer to Appendix G for CCS Surge Tank Level Switch Setpoints following this event guide.</td></tr>
<tr><td></td><td>CREW</td><td>[3] DISPATCH operator for local inspection to determine problem.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO</td><td>[4] VERIFY proper valve alignment in accordance with 1-SO-70-1, <i>Component Cooling Water System</i> Train A, and 0-SO-70-1 Component Cooling Water System Train B.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP</td><td>[5] MONITOR level in both surge tanks to determine seal leakage return problems.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>[6] MONITOR level increase in pocket sump for possible CCS leak inside containment.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO/BOP</td><td>[7] IF sufficient level cannot be maintained, THEN GO TO AOP-M.03, <i>Loss of Component Cooling Water</i> for emergency makeup instructions. [C.1]</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Evaluator Note: SRO/Crew may go to AOP-M.03, <i>Loss of Component Cooling Water;</i> Section 2.4 is applicable. Since the leak is within the capacity of make-up water flow, the crew needs to dispatch AUOs to make up to the DI Water System to ensure make-up inventory is available for the CCS System</td></tr>
</table>

Op Test No.:	NRC 2010302	Scenario #	4	Event #	1	Page	3	of 44

Event Description: Component Cooling Line Break (within make-up capacity)
Make-up valve 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior
	SRO	US may use or refer to AOP-M-03, *Loss of Component Cooling Water;* Section 2.4 Train B CCS Header Failure; Steps 1-4 are adequate to address this event. Based on indications of 1-LI-70-99A, CCS Surge Tank A Outlet ("B" Header) is lowering.
	CAUTION:	If any Containment Spray Pump is running with NO CCS cooling, spray pump may experience bearing failure after 10 minutes.
	BOP	1. **DISPATCH** operators with radios to Auxiliary Building to LOCATE failure and PERFORM valve manipulations.
	BOP	2. **DISPATCH** an operator with radio to perform Appendix B, Operation of App. R Valves Required by Section 2.4.
	SRO/BOP	3. **CHECK** ERCW flows NORMAL for plant conditions: ERCW Flows are normal- crew moves on
	NOTE:	In the event of a "B" train line break the surge tank baffle prevents the "A" train from draining to less than 57% indicated level.
	NOTE:	Appendix G lists expected responses to various CCS surge tank levels.
	SRO/BOP	4. **MONITOR** Train B CCS surge tank level between 65% and 85%. • 1(2)-LI-70-99A, Unit 1(2) B CCS Surge Tank Level. ***(RNO Required)***
	SRO/BOP	**RNO:** **IF** CCS surge tank level is less than 64%, **THEN ENSURE** surge tank auto makeup starts.
	BOP	**IF** necessary to locally initiate surge tank makeup, **THEN DISPATCH** operator to perform the following: • Manually make up from demin water, **OR** • **ALIGN** ERCW supply **USING** Appendix E, Aligning ERCW Emergency Makeup. **[C.1]**

Op Test No.: NRC 2010302 Scenario # 4 Event # 1 Page 4 of 44

Event Description: Component Cooling Line Break (within make-up capacity)
Make-up valve 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior
	NOTE:	Pressure range provided is expected value based on one Train B CCS pump in service. Plant conditions may cause values to be outside the expected range.
	BOP	5. **MONITOR** the following: • Train B CCS Surge Tank levels greater than 20%. • 0B1/0B2 CCS HX inlet pressure NORMAL (between 90 and 118 psig). ***(RNO Required)***
Evaluator Note: Train B CCS Pump cavitation is not expected if the crew initiates make-up and isolates the leak per the following step RNO.		
		RNO: **IF** any Train B CCS pump is cavitating **OR** has lost suction, **THEN STOP** affected pump.
		IF any of the following conditions exists:
	BOP	• loss of surge tank level is imminent **OR** • Train B header break is indicated which requires isolation **OR** • Train B CCS flow has been lost,
	BOP	**THEN PERFORM** the following: a. **STOP** and **LOCK OUT** Train B pumps: • CCS Pump currently aligned to Train B (C-S, 1B-B, or 2B-B) • 1B-B Containment Spray Pump • 2B-B Containment Spray Pump
	BOP	b. **CLOSE** Train B ESF Header Isol Valves: • 0-FCV-70-12, 0B1/0B2 HX Outlet [Rx MOV Bd 1B2-B Compt. 12B] • 1-FCV-70-75, RHR HX B Return Isol [Rx MOV Bd 1B2-B Compt. 14B] • 2-FCV-70-75, RHR HX B Return Isol [Rx MOV Bd 2B2-B Compt. 14B]

Op Test No.:	NRC 2010302	Scenario #	4	Event #	1	Page	5 of 44

Event Description: Component Cooling Line Break (within make-up capacity)
Make-up valve 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior
	SRO	c. **IF** in Mode 4, 5, or 6, **THEN... N/A**
	NOTE 1:	When Train B CCS is out of service, the associated CCPs, SI Pumps, and RHR Pumps are INOPERABLE for ECCS purposes due to not being able to fulfill their design function for sump recirculation.
	NOTE 2:	When CCS is out of service to mechanical seal HXs, the affected CCPs, SI Pumps, and RHR Pumps have been evaluated to be AVAILABLE. These pumps can run indefinitely without CCS cooling water to mechanical seal HXs. **[C.4]**
	SRO	6. **EVALUATE** Tech Specs and EPIP-1 **USING** Appendix H.
		• 3/4.5.2 ECCS – OPERATING 3.5.2- 2 ECCS trains shall be OPERABLE. (TS NOTES 1&2 MODE 3 applicable…N/A) <u>ACTION a</u>.: w/ 1 or more trains inoperable and w/ at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available, restore to OPERABLE status w/i 72 hrs or HT STBY w/i next 6 hrs & HT SHDN w/i following 6 hrs.
		• 3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS 3.6.2.1- 2 independent containment spray subsystems shall be OPERABLE with each subsystem comprised of: a. A Containment Spray train with: 1. One OPERABLE Containment Spray pump. 2. One OPERABLE Containment Spray heat exchanger. 3. An OPERABLE Containment Spray pump flow path capable of taking suction from the refueling water storage tank and transferring suction to the containment sump W/ 1 CSS subsystem inoperable, restore to OPERABLE w/i 72 hrs or HT STBY w/i next 6 hrs; restore inoperable subsystem to OPERABLE w/i next 48 hrs or CLD SHDN w/i next 30 hrs.
		• 3/4.7.3 COMPONENT COOLING WATER SYSTEM 3.7.3- 2 independent component cooling water loops shall be OPERABLE. W/ 1 CCS water loop OPERABLE, restore 2 OPERABLE w/i 72 hrs or HT STBY w/i 6 hrs & CLD SHDN w/i following 30 hrs.
	BOP	7. **ENSURE** all breakers are reopened **USING** Appendix B, Operation of App. R Valves Required by Section 2.4.
	SRO	8. **NOTIFY** SM to evaluate OPDP-9, Emergent Issue Response.
	CREW	9. **INITIATE** Maintenance as required.
	SRO	10. **GO TO** appropriate plant procedure

Op Test No.:	NRC 2010302	Scenario #	4	Event #	1	Page	6 of 44

Event Description: Component Cooling Line Break (within make-up capacity)
Make-up valve 1-FCV-70-63 fails to open automatically

Time	Position	Applicant's Actions or Behavior
		END OF SECTION
Evaluator Note: SRO/BOP determines CCS Surge Tank manual make-up is adequate and will be required to maintain tank level (for the remainder of the scenario).		
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 CCS Surge Tank level controlled, leak isolated and Tech Specs identified.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	2	Page	7 of 44
Event Description:	1-PT-1-73, Main Turbine Impulse pressure transmitter fails low						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 2		
Alarms/Indications **Annunciator:** **1-M-5** • **1-XA-55-5A C-6, "TS-68-2P/Q REAC COOL LOOPS T REF T AUCT HIGH-LOW"** • **1-XA-55-5A B-7, "STEAM GEN LVL HIGH-LOW DEVIATION"** **Indications** **1-M-4** • **Automatic Control Rod insertion** **1-M-5** • **1-TR-68-2B, RCS/TURBINE TEMP**		
	Crew	Respond to alarms in accordance with ARPs
	RO	Identifies automatic control rod motion with no runback in progress, positions Rod Control Handswitch 1-HS-85-5110 to MANUAL
	SRO	Direct entry to: AOP-C.01, Rod Control System Malfunctions, Sect 2.1, Uncontrolled Rod Bank Movement **OR** AOP-I.08, Turbine Impulse Pressure Instrument Malfunction
		AOP-C.01, Rod Control System Malfunctions **Sect 2.1, Uncontrolled Rod Bank Movement**
	NOTE:	Step 1 is an immediate action step.
	RO	1. **STOP** uncontrolled rod motion: a. **PLACE** rod control in MAN. b. **CHECK** rod motion STOPPED.
	CAUTION:	Control Rods should NOT be manually withdrawn during a plant transient.
	RO/BOP	2. **CHECK** for plant transient:
	RO	a. **CHECK** reactor power and T-avg STABLE.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	2	Page	8 of 44

Event Description: 1-PT-1-73, Main Turbine Impulse pressure transmitter fails low

Time	Position	Applicant's Actions or Behavior
	Crew	3. **CHECK** for instrumentation malfunction:
	RO	a. **CHECK** nuclear instrumentation OPERABLE.
	RO	b. **CHECK** RCS RTDs OPERABLE
	BOP	c. **CHECK** turbine impulse pressure channels OPERABLE. ***(RNO required)***
	SRO	**RNO:** c. **GO TO** AOP-I.08, Turbine Impulse
		AOP-I.08, Turbine Impulse Pressure Instrument Malfunction **Section 2.1 Unit 1: Failure of Turbine Impulse Pressure Instrument 1-P-1-73**
	RO/SRO	1. **ENSURE** control rods in MANUAL.
	NOTE:	Loss of Instrument Power to S/G level setpoint program input will drive setpoint below 33%.
	BOP	2. **EVALUATE** placing main feedwater reg valves in MANUAL to maintain S/G levels on program Based on NOTE and secondary plant evaluation, FRVs remain in AUTO
		3. **ENSURE** steam dumps in steam pressure mode:
		a. **PLACE** steam dump FSV handswitches in OFF.
		b. **PLACE** steam dump mode selector in STEAM PRESS mode.
		c. **ENSURE** zero output (demand).
		d. **PLACE** steam dump FSV handswitches in ON.
		e. **ENSURE** steam dump controller setpoint at 1005 psig.
	SRO	4. **EVALUATE** the following Tech Spec for applicability • 3.3.1.1, Reactor Trip System Instrumentation **Functional Unit 22.E: Reactor Trip System Interlocks, Turbine Impulse Chamber Pressure, P-13 - ACTION 8.b: Reactor Trip- Turbine Trip**; w/ less than Minimum Number of Channels OPERABLE, declare the interlock inoperable and verify that all affected channels of the functions listed below are OPERABLE or apply the appropriate ACTION statement(s) for those functions.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	2	Page	9 of 44
Event Description:	1-PT-1-73, Main Turbine Impulse pressure transmitter fails low						

Time	Position	Applicant's Actions or Behavior
	RO	5. **DETERMINE** Program T-avg for current reactor power **USING** TI-28 Figure 3 or ICS (NSSS / BOP, Program Reactor Average Temperature).
	RO	6. **RESTORE** T-avg to within 1°F of program value **USING** one of the following:
		• **POSITION** control rods **OR**
		• **ADJUST** turbine load **OR**
		• **ADJUST** RCS boron concentration.
	NOTE:	If performing this AOP in conjunction with AOP-I.11 for Eagle LCP failure,… **SRO determines NOTE is N/A**
	Crew	7. **NOTIFY** I&C to perform Appendix A, Removing Unit 1 Turbine Impulse Pressure Loop 1-P-1-73 from Service.
	Crew	8. **INITIATE** Maintenance on 1-P-1-73.
	SRO	9. **GO TO** appropriate plant procedure.
		END OF SECTION
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Tech Specs are identified.		

Op Test No.:	NRC 2010302	Scenario #	4	Event #	3	Page	10 of 44
Event Description:	Gen H2 Temp Hx Cooling Water Controller failure						

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Simulator Operator: When directed, initiate Event 3</td></tr>
<tr><td colspan="3">Alarms/Indications available:
Multiple ICS H2 Cooler Outlet Gas Temperature Alarms

Annunciators:
1-M-1
• 1-XA-55-1A A-1, "GEN STATOR TEMPERATURE HIGH"
B-4, "GEN STATOR COOL SYS FAILURE"
Indications:
1-M-2
• Indicator 1-TI-35-76 "GENERATOR H2 TEMP" trending to top of scale (indicator scale: 50-150°F)</td></tr>
<tr><td>T = 30</td><td>BOP</td><td>Respond to ICS alarm, HYDROGEN COOLER OUTLET GAS TEMP (2 monitoring points) or MAIN GENERATOR window, TEMP's FOR HYDROGEN CLR</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP</td><td>Transfer 1-TIC-24-48, GENERATOR H2 COOLER REMP CONTROLLER, to MANUAL; manually control H2 cooling water flow to restore H2 temperature to normal (95-115°F)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>CREW</td><td>Respond using ARPs 1-AR-M1-A, A-1, B-4, that direct entry into AOP-S.06, Turbine Trip, Section 2.0 for the failure.
If the unit is not reduced to <15% power within 45 seconds, an automatic MT trip will occur.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.</td></tr>
<tr><td></td><td></td><td>CREW Brief would typically be conducted for this event as time allows prior to the next event.</td></tr>
<tr><td></td><td></td><td>Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief.
<u>Operations Management</u> - Typically Shift Manager.
<u>Maintenance Personnel</u> – Typically Maintenance Shift Supervisor (MSS). (Note: Maintenance notification may be delegated to the Shift Manager).</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Lead Examiner may cue the next event when MG H2 Temperature is returned to normal</td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 4 Event # 4 Page 11 of 44

Event Description: Steam Generator Tube Leak

Time	Position	Applicant's Actions or Behavior

Simulator Operator: When directed, initiate Event 4

Indications/Alarms

Annunciator:

0-M-12

- **0-XA-55-12-AC-1, "CNDS VAC PMP LO RNG AIR EXH MON HIGH RAD"**
- **B-5, "STM GEN BLDN LIQ SAMP MON HI RAD (~10-12 min delay)"**

Indications

0-M-12

- **1-RR-90-119, CONDR VAC PUMP EXH RADMON increasing count rate**
- **1-RR-90-120, SG BLDN LIQ SAMP RADMON increasing counts**

Significant Resultant Alarms/Indications:

1-M-5

Indications

- **1-LR-68-339, RCS PZR LEVEL recorder showing actual level deviating (low) from program level**

T+35	Crew	Respond to alarms in accordance with ARPs
	BOP	[1] **CHECK** 1-RM-90-119 rate meter and 1-RR-90-119 on 0-M-12 for indication of increased radiation.
	NOTE: Alarm validity may be determined based on absence of instrument malfunction alarm, indicated response of the rad monitor, and, if possible, other indications such as blowdown monitor (recognizing the difference in response time due to blowdown transport time).	
	BOP	[2] **IF** alarm is valid, **THEN NOTIFY** RCL to perform 1-SI-CEM-068-137.5 Primary to Secondary Leakage via Steam Generators. **SRO/BOP determines to continue procedure- valid alarm.**

Evaluator Note: SRO/crew member may refer to Operations Chemistry Information Sheet in turnover package.

	BOP	[3] **IF** alarm is valid, **THEN GO TO** AOP-R.01, Steam Generator Tube Leak.
	BOP	[4] **IF** rad monitor is inoperable… **STEP N/A**
	SRO	Direct entry to AOP-R.01, Steam Generator Tube Leak Section 2.1 based on high secondary radiation and Pzr level dropping OR Charging flow rising

Op Test No.: NRC 2010302 Scenario # 4 Event # 4 Page 12 of 44

Event Description: Steam Generator Tube Leak

Time	Position	Applicant's Actions or Behavior
		AOP-R.01, Steam Generator Tube Leak **Section 2.1, S/G Tube Leak Requiring Rapid Shutdown**
		1. **MONITOR** if Pressurizer level can be maintained:
		a. **CONTROL** charging flow **USING** FCV-62-93 and FCV-62-89 as necessary to maintain Pzr level on program.
		b. **MONITOR** pressurizer level STABLE or RISING. ***(RNO may be implemented later)***
		RNO: b. **PERFORM** the following:
		1) **ENSURE** letdown isolated:
		• FCV-62-72 CLOSED
		• FCV-62-73 CLOSED
		• FCV-62-74 CLOSED
		2) **IF** Pzr level continues to drop, **THEN START** additional CCP as necessary.
		IF Pzr level CANNOT be maintained greater than 5% **OR** loss of Pzr level is imminent, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **WHEN** reactor is tripped, **THEN INITIATE** Safety Injection.
		3) **GO TO** E-0, Reactor Trip or Safety Injection.
	NOTE 1:	Appendix F or G can be used to estimate leak rate.
Evaluator Note: Appendix F and G are at the end of this event guide.		
	NOTE 2:	If letdown was isolated in Step 1, the leak rate may have exceeded the capacity of one CCP in the normal charging alignment (EAL 1.2.2.P).
		2. **EVALUATE** EPIP-1, Emergency Plan Classification Matrix. **NO Classification: RCS Identified leakage (Primary to Secondary leakage) is less than 25 gpm.**
	RO	3. **MONITOR** VCT level:
		• **MAINTAIN** VCT level greater than 13% **USING** auto or manual makeup
		• **CHECK** VCT makeup capability adequate to maintain level. ***(RNO required when VCT make-up is required)***

Op Test No.:	NRC 2010302	Scenario #	4	Event #	4	Page	13	of 44
Event Description:	Steam Generator Tube Leak							

Time	Position	Applicant's Actions or Behavior
	RO	**RNO:** **IF** VCT level CANNOT be maintained, **THEN PERFORM** the following:
		a. **ENSURE** CCP suction aligned to RWST:
		1) **OPEN** LCV-62-135 and -136.
		2) **CLOSE** LCV-62-132 and 133.
		b. **IF** in Mode 1 or 2, **THEN PERFORM** the following:
		1) **TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection.
		2) **WHEN** ES-0.1, Reactor Trip Response, is entered, **THEN CONTINUE** with Step 4 of this AOP
		4. **MONITOR** indications of leaking S/G:
		a. **NOTIFY** Chem Lab to evaluate Primary to Secondary Leakage **USING** 1(2)-SI-CEM-068-137.5:
		• Method 1, Rapid Identification of Leaking Steam Generators
		• Method 3, Condenser Vacuum Exhaust (CVE) Sampling for Determination of Primary-to-Secondary (P/S) Leakage.
		b. **NOTIFY** RADCON to monitor Turbine Building and site environment:
		• Steam lines
		• S/G blowdown
		c. **IDENTIFY** leaking S/G(s) **USING** any of the following:
		• Unexpected rise in any S/G narrow range level **OR**
		• S/G sample results **OR**
		• RADCON survey of main steamlines and S/G blowdown lines **OR**
		• High radiation on any main steamline radiation monitor.

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Event Description: Steam Generator Tube Leak

Time	Position	Applicant's Actions or Behavior
		5. **EVALUATE** the following Tech Specs for applicability:
		- 3.4.6.2, Operational Leakage: Action c Reactor Coolant System leakage shall be limited to: c. 150 gallons per day of primary-to-secondary leakage through any one steam generator; ACTION: w/ primary-to-secondary leakage not w/i limits, HT STBY w/i 6 hrs & CD SHDN w/i following 30 hrs.
	NOTE:	Initiating shutdown required by Tech Specs requires 4 hour NRC notification per SPP-3.5, Regulatory Reporting Requirements.
Evaluator Note: AOP-R.01 should be continued in parallel with AOP-C.03, Rapid Shutdown, and directed by SRO. Refer to the next event guide for rapid shutdown		
	SRO	6. **INITIATE** rapid shutdown by performing the following:
		a. **ANNOUNCE** S/G tube leak on PA system.
		b. **PERFORM** rapid shutdown **USING** AOP-C.03 WHILE continuing in this section.
		c. **ENSURE** power reduced to less than 50% within one hour.
		d. **ENSURE** unit in Mode 3 within the following 2 hours.
	SRO	**Implements unit shutdown to meet the 1-hour and 2 hour limits** ***(SRO may handoff AOP-R.01 to BOP to perform single-performer while directing rapid shutdown)***
	SRO	7. **MINIMIZE** Spread of contamination:
	BOP	a. **IF** tube leak identified on S/G #1 **AND** S/G #4 is intact, **THEN PERFORM** the following:
	SRO	1) **EVALUATE** LCO 3.7.1.2.
		- 3.7.1.2, Auxiliary Feedwater (AFW) System ACTION: a. w/ 1 AFW train inoperable in MODE 1, 2, or 3, restore w/i 72 hrs or HT STBY w/i next 6 hrs & HT SHDN w/i following 12 hrs. -Surveillance Requirement: 4.7.1.2.1 At least once per 31 days, verify each AFW manual, power operated, and automatic valve in each water flow path, and in both steam supply flow paths to the steam turbine driven pump, that is not locked, sealed, or otherwise secured in position, is in the correct position.
	BOP	2) **CLOSE** FCV-1-15 TDAFWP steam supply from S/G #1.
	BOP	3) **ENSURE** FCV-1-16 TDAFWP steam supply from S/G #4 **OPEN**.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	4	Page	15 of 44
Event Description:	Steam Generator Tube Leak						

Time	Position	Applicant's Actions or Behavior
	SRO	b. **PERFORM** EA-0-3, Minimizing Secondary Plant Contamination.
	BOP	c. **IF** S/G blowdown is aligned to the river, **THEN TERMINATE** S/G Blowdown to river:
		1) **ENSURE** S/G blowdown flow control FCV-15-43 **CLOSED**.
		2) **DISPATCH** operator to perform EA-15-1, Realigning S/G Blowdown to Cond DI.
		3) **WHEN** EA-15-1 completed, **THEN ADJUST** FCV-15-43 to establish desired blowdown flow.
	BOP	d. **NOTIFY** Chem Lab to determine release rate for condenser vacuum exhaust **USING** 0-SI-CEM-030-415.0 and 0-SI-CEM-030-407.2.
	BOP	e. **NOTIFY** Chem Lab to evaluate rerouting steam generator sample drain lines to FDCT **USING** 0-TI-CEM-000-016.4.
	BOP	f. **WHEN** notified by Chemistry to bypass Condensate DI, **THEN DISPATCH** AUO to bypass polishers on affected unit:
		• Unit 1 Only: **PLACE** 1-HS-14-3, Condensate Polisher Bypass Valve to OPEN. [Cond DI Bldg]
		• Unit 2 Only: Step N/A
	SRO	g. **EVALUATE** Appendix C, Contingency Plan for Control and Processing of Large Volumes of Contaminated Water **[C.5]**.
	RO	8. **CHECK** reactor trip breakers OPEN. ***(RNO required)***
	SRO	**RNO:** **DO NOT CONTINUE** this section UNTIL E-0 immediate actions are completed.
	SRO	IF a reactor trip is directed, THEN GO TO E-0, *Reactor Trip or Safety Injection.*

Op Test No.:	NRC 2010302	Scenario #	4	Event #	4	Page	16 of 44
Event Description:	Steam Generator Tube Leak						

Time	Position	Applicant's Actions or Behavior
	SRO	Direct Manual Rx Trip
	SRO	Enter and Direct E-0 Immediate Operator Actions (IOAs)

Lead Examiner may cue next event when AOP-C.03 Shutdown is in progress; the remainder of AOP-R.01 will not be completed due to the implementation of E-0, E-3.

Op Test No.: NRC 2010302 Scenario # 4 Event # 4 Page 17 of 44

Event Description: Steam Generator Tube Leak

SQN	STEAM GENERATOR TUBE LEAK	AOP-R.01 Rev. 26

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APPENDIX F

ESTIMATING RCS LEAK RATE USING CVCS FLOW BALANCE

NOTE 1 This method is recommended when leak requires rise in charging flow greater than ~10 gpm. Appendix G is more accurate for smaller leak rates.

NOTE 2 This appendix assumes RCS temperature and charging flow are approximately constant.

	INITIAL	FINAL	CHANGE
PZR Level			[1] (negative for level decrease)
Time			[2]
Charging Flow	[3]		
Letdown Flow	[4]		
Total RCP Seal Return Flow	[5]		

Pressurizer Level Conversion

Pressurizer level change		conversion factor		Time Change		Pzr Level Rate of Change (positive for level rising)
%	X	62 gal / %	÷	min	=	gpm
step [1] above				step [2] above		[6]

Leak Rate Calculation

Charging Flow		Letdown Flow		Seal Return Flow		Pzr Level Rate of Change		Instrument error correction factor		RCS Leak Rate
	–		–		–		+	3 gpm	=	gpm
step [3] above		step [4] above		step [5] above		step [6] above				

Op Test No.:	NRC 2010302	Scenario #	4	Event #	4	Page	18 of 44
Event Description:	Steam Generator Tube Leak						

SQN	**STEAM GENERATOR TUBE LEAK**	**AOP-R.01** **Rev. 26**

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APPENDIX G

ESTIMATING RCS LEAK RATE USING VCT AND PZR LEVEL

CAUTION **This appendix CANNOT be used during VCT makeup, boration, or dilution.**

NOTE This appendix assumes RCS temperature is approximately constant.

	VCT LEVEL (%)	**PZR LEVEL (%)**	**TIME (min)**
INITIAL			
FINAL			
CHANGE	**[1]** (positive for level decrease)	**[2]** (positive for level decrease)	**[3]**

VCT Level Conversion

VCT level change		conversion factor		Time Change		VCT Level Rate of Change (positive for level lowering)
_______ %	X	20 gal / %	÷	_______ min	=	_______ gpm
step **[1]** above				step **[3]** above		**[4]**

Pressurizer Level Conversion

Pressurizer level change		conversion factor		Time Change		Pzr Level Rate of Change (positive for level lowering)
_______ %	X	62 gal / %	÷	_______ min	=	_______ gpm
step **[2]** above				step **[3]** above		**[5]**

Leak Rate Calculation

VCT Level Rate of Change		Pzr Level Rate of Change		RCS Leak Rate
_______	+	_______	=	_______ gpm
step **[4]** above		step **[5]** above		

Op Test No.:	NRC 2010302	Scenario #	4	Event #	5, 6	Page	19 of 44
Event Description:	Rapid plant shutdown, Rapid Boration Valve fails to open; RWST use for rapid shutdown						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: No action required for Event 5; Verify Event 6 actuates as expected		
Annunicators/Indications • **Rapid Shutdown: N/A** **1-M-6** • **1-HS-62-138A, EMERGENCY BORATION FLOW CONTROL VALVE indicates closed (GREEN light lit) with handswitch in the 'OPEN' position.** • **1-FI-62-137A, EMERG BORATION FLOW indicator indicates '0'**		
T+50	SRO	Enter and Direct performance of AOP-C.03, Rapid Shutdown or Load Reduction.
	SRO	1. **ENSURE** crew has been briefed on reactivity management expectations **USING** Appendix E.
	Crew	2. **NOTIFY** following personnel of rapid shutdown or load reduction: • Load Coordinator • Chemistry • RADCON • Plant Management
	BOP/RO	3. **MONITOR** reactor/turbine trip NOT required **USING** Appendix A, Reactor and Turbine Trip Criteria.
	BOP/RO	4. **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.	
	RO/SRO	5. **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 **OR**
		• volume recommended by Reactor Engineering

Op Test No.:	NRC 2010302	Scenario #	4	Event #	5, 6	Page	20 of 44
Event Description:	Rapid plant shutdown, Rapid Boration Valve fails to open; RWST use for rapid shutdown						

Time	Position	Applicant's Actions or Behavior
	SRO	b. **DETERMINE** recommended boration flowrate from table below or from Reactor Engineering: ***(SRO discretion may be used to determine reduction rate)***
		(table below)
	RO	c. **ENSURE** concurrence obtained from US and STA for boration volume and flowrate.
	RO	d. **PLACE** boric acid transfer pump aligned to blender in FAST speed.
	RO	e. **ADJUST** FCV-62-138 to establish desired flow rate. ***(RNO required)***
		RNO: **INITIATE** normal boration **USING** Appendix D **(following)**.
		APPENDIX D **NORMAL BORATION**
	RO	**[1] PLACE [HS-62-140A]** Makeup Control to STOP position.
	RO	**[2] PLACE [HS-62-140B]** Makeup mode selector switch in BORATE position.
	NOTE:	Boric Acid controller setting is twice the desired flow rate. Maximum Boric Acid flow is ~45 gpm.
	RO	**[3] ADJUST [FC-62-139]** BA flow controller setpoint for desired flow rate.
	RO	**[4] ADJUST [FQ-62-139]** BA integrator (batch counter) to desired boric acid volume.

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

Op Test No.:	NRC 2010302	Scenario #	4	Event #	5, 6	Page	21	of 44

Event Description: Rapid plant shutdown, Rapid Boration Valve fails to open; RWST use for rapid shutdown

Time	Position	Applicant's Actions or Behavior
	RO	[5] **PLACE [HS-62-140A]** Makeup Control Switch mode selector switch to START.
	RO	[6] **IF** desired boric acid flow rate NOT obtained, **THEN ADJUST** one or both of the following as necessary:
		• **[FC-62-139]** BA flow controller
		• recirculation valve for BAT aligned to blender.
	RO	[7] **ENSURE** desired boric acid flow indicated on FI-62-139.
		[8] **WHEN** required boric acid volume has been added, **THEN PERFORM** the following:
	RO	[a] **PLACE [HS-62-140A]**, Makeup Control to STOP position.
	RO	[b] **ENSURE [FC-62-142]**, Primary Water to Blender Flow Controller in AUTO with dial indicator set at 35%.
	RO	[c] **ADJUST [FC-62-139]**, Boric Acid Flow Controller to desired blend solution **USING** TI-44 Boron Tables.
	RO	[d] **PLACE [HS-62-140B]**, Makeup Mode Selector Switch in AUTO position.
	RO	[e] **PLACE [HS-62-140A]**, Makeup Control to START.
		AOP-C.03 Step 5.f continued
	RO	f. **CONTROL** boration flow as required to inject desired boric acid volume

Op Test No.:	NRC 2010302	Scenario #	4	Event #	5, 6	Page	22 of 44

Event Description: Rapid plant shutdown, Rapid Boration Valve fails to open; RWST use for rapid shutdown

Time	Position	Applicant's Actions or Behavior
	SRO	g. **GO TO** Step 7.
	RO	6. **IF** borating from RWST,**THEN INITIATE** boration to maintain control rods above low-low insertion limit:
		a. **OPEN** LCV-62-135 or -136.
		b. **CLOSE** LCV-62-132 or -133.
	SRO	7. **INITIATE** load reduction as follows:
	RO	a. **ADJUST** load rate to desired value: ***(SRO/RO chooses Normal Boration rates)***
		• between 1% and 4% per minute if borating via FCV-62-138 **OR**
		• ***between 1% and 3% per minute if borating via normal boration*** ***(App. D)***
		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

Time	Position	Applicant's Actions or Behavior
	BOP	c. **INITIATE** turbine load reduction by depressing GO pushbutton.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	5, 6	Page	23	of 44
Event Description:	Rapid plant shutdown, Rapid Boration Valve fails to open; RWST use for rapid shutdown							

Time	Position	Applicant's Actions or Behavior
		d. **CONTROL** turbine load reduction as necessary to reduce power to desired level.
	RO	8. **MONITOR** T-avg/T-ref mismatch:
	RO	a. **CHECK** T-ref indication AVAILABLE. ***(RNO required due to previous failure –PT-1-73, MANUAL Rod Control)***
	RO/ SRO	b. **MONITOR** automatic rod control maintaining T-avg/T-ref mismatch less than 3°F. ***(RNO required; however b. part 1 is not applicable since AUTO Rod Control is not available.)***
		RNO: b. Part 1: **IF** auto rod control is functional… **N/A**
	RO	b. Part 2: **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,
	RO/ SRO	**THEN RESTORE** T-avg to within 3°F of T-ref **USING** manual rod control as necessary.
	RO/ SRO	b. Part 3: **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.
	BOP	9. **MONITOR** automatic control of MFW pump speed AVAILABLE.
	BOP	10. **STOP** secondary plant equipment **USING** Appendix B, Secondary Plant Equipment.

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Event Description: Rapid plant shutdown, Rapid Boration Valve fails to open; RWST use for rapid shutdown

Time	Position	Applicant's Actions or Behavior
	NOTE: If LEFM thermal power (U2118) is inoperable, rod insertion limit curve must be raised by 3 steps. Rod insertion limit alarms and ICS display are NOT automatically adjusted when LEFM is inoperable.	
	RO	11. **MONITOR** control rods above low-low insertion limit **USING** ICS or COLR.
		RNO (if required): **ENSURE** boration flow greater than applicable value: • 35 gpm from BAT **OR** • 90 gpm from RWST. **REDUCE** turbine load rate as necessary.
Evaluator Note: Additional AOP-C.03 Steps not included as required power reduction should be complete at or around this step.		
When desired, the Lead Examiner may cue the next event.		

Op Test No.:	NRC 2010302	Scenario #	4	Event #	7, 8, 9	Page	25 of 44

Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
Simulator Operator: Event 7- Increase SGTR to 8.6 severity (400 gpm) with 300 second ramp; Event 8- Verify expected actuation; DELETE as directed; Event 9- Insert Pressurizer Spray Valve failures- BOTH full open after they are opened for E-3 RCS depressurization.		
Annunicators/Indications Available: **Indications:** **1-M-4** • **1-LI-68-339A, 335A, 320A, RCS PZR LEVEL indicators decreasing** **1-M-5** • **1-PR-68-340, RCS PZR PRESS recorder trending down** • **1-LR-68-339 RCS PZR LEVEL recorder trending down** • **1-PI-68-340A, 334, 323, 322 RCS PZR PRESS indicators decreasing** • **1-FI-68-93A, CHARGING HDR FLOW indicator increasing** **1-M-30** • **1-RI-90-421, MAIN STEAM RAD MONITOR increasing counts**		
		AOP-R.01 Step 1 RNO:
		IF Pzr level CANNOT be maintained greater than 5% **OR** loss of Pzr level is imminent, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **WHEN** reactor is tripped, **THEN INITIATE** Safety Injection.
		3) **GO TO** E-0, Reactor Trip or Safety Injection.
	SRO	Direct Manual Reactor Trip and Safety Injection based on pressurizer level loss imminent from AOP-R.01 Step 1 RNO.
	RO	Manually Trip Reactor and initiate SI.
	SRO	Enter and direct performance of E-0, Reactor Trip Or Safety Injection.

Evaluator Note: Following IOA performance, prior to Steps 1-4 immediate action verification, RO/BOP surveys MCBs for any expected automatic system response that failed to occur. Upon discovery, they may take manual action(s) to align plant systems as expected for the event in progress. (Ref. EPM-4, Prudent Operator Actions)

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
E-0, *Reactor Trip or Safety Injection*		
Critical Task: Equalize pressure between RCS and ruptured SG to stop primary to secondary leakage (40 minutes) **START TIME:** ____________ **END TIME:** ____________ **(pg 36)**		
	Note 1 Steps 1 through 4 are immediate action steps	
	Note 2 This procedure has a foldout page	
	RO	1. VERIFY reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
	BOP	2. VERIFY turbine TRIPPED: • Turbine stop valves CLOSED.
	BOP	3. VERIFY at least one train of shutdown boards ENERGIZED. • Attempt to restore power to at least ONE train of shutdown boards • Place DG 1A-A control switch in START • Verify Train A Shutdown Boards ENERGIZED
	RO	4. DETERMINE if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated)
Evaluator Note: ES-0.5 including appendices are contained in attachment at back of scenario guide		
	BOP	5. PERFORM ES-0.5, Equipment Verifications WHILE continuing in this procedure.

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
	RO/BOP	6. 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 all S/Gs. (Heat Sink is available from AFW: if >440 gpm available.)
	RO	7. 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
	RO	8. CHECK RCP trip criteria: a. CHECK the following: • RCS pressure less than 1250 psig. AND • At least one CCP OR SI pump RUNNING ***(RNO required)***
		RNO: a. **GO TO** Step 9.
	RO	9. MONITOR RCS temperatures: • IF any RCP running, THEN CHECK T-avg stable at or trending between 547°F and 552°F.

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
		OR • IF RCPs stopped… **N/A** ***(RNO required)***
		RNO: RCPs are running **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. c. **IF** cooldown continues after AFW flow is controlled, **THEN CLOSE** MSIVs and MSIV bypass valves. d. **IF** temperature greater than 552°F… **N/A**
	RO	10. 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.
	CREW	11. DETERMINE S/G secondary pressure boundaries are INTACT: • CHECK all S/G pressures CONTROLLED or RISING. • CHECK all S/G pressures greater than 140 psig.
	CREW	12. **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). ***(RNO required)***
		RNO: **IF** any S/G has level rising in an uncontrolled manner **OR** has high radiation, **THEN PERFORM** the following:

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Event Description:
SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
Evaluator Note:		at Step 12.a, **MONITOR** status trees, the crew will implement status tree monitoring via SPDS. When a RED or ORANGE path status tree is observed, the SRO will designate one of the Board operators (typically the BOP) to verify status tree conditions using **1-FR-0, UNIT 1 STATUS TREES**. Once verified, the SRO should direct the crew to transition to the appropriate RED and/or ORANGE path procedure(s).
		a. **MONITOR** status trees.
		b. **GO TO** E-3, Steam Generator Tube Rupture.
		Crew transitions to E-3, Steam Generator Tube Rupture.
	SRO	Enter and direct performance of E-3 Steam Generator Tube rupture.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	7, 8, 9	Page	30	of	44

Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
		E-3, Steam Generator Tube Rupture
		1. **MONITOR** at least one RCP RUNNING.
		2. **MONITOR** RCP trip criteria:
		a. **CHECK** the following:
		• RCS pressure less than 1250 psig **AND** • At least one CCP **OR** SI pump RUNNING. ***(RNO required)***
		RNO: . **GO TO** Step 3
		3. **MONITOR** RCP trip criteria:
		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.
	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
Evaluator Note:	**Critical Task** is to Isolate Steam flow and Feedwater flow to ruptured S/G prior to RCS Cooldown initiation. E-3 Steps 4 & 5 inclusive completes operator-directed actions to isolate the Ruptured SG and, thus to complete this **Critical Task**.	
Critical Task		4. **ISOLATE** flow from Ruptured S/G(s):
		a. **ADJUST** Ruptured S/G(s) atmospheric relief controller setpoint to 87% in AUTO. (1040 psig)

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
		E-3, Steam Generator Tube Rupture
		b. **CHECK** Ruptured S/G(s) atmospheric relief hand switch in P-AUTO and valve(s) CLOSED.
Evaluator Note: Realigning TDAFW to S/G #4 not required since TDAFW pump is Tagged out of service.		
	BOP	c. **CLOSE** TD AFW pump steam supply from Ruptured S/G FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4).
	BOP	d. **VERIFY** Ruptured S/G(s) blowdown isolation valves CLOSED.
Evaluator Note: #1 SG MSIV, the ruptured S/G MSIV, will not close requiring isolation of the non-ruptured MSIVs, other steam paths both from the MCR and locally. #1 S/G MSIV will close when EA-1-1, Closing MSIVs Locally, E-3 alternate path actions, is implemented. The crew will complete the cooldown on the intact SG atmospheric relief valves. #1 SG MSIV should be closed prior to RCS Cooldown initiation in Step 8		
	BOP	e. **CLOSE** Ruptured S/G(s) MSIV and MSIV bypass valve. ***(RNO required)***
		RNO: . **PERFORM** the following:
	BOP	1) **CLOSE** Intact S/G MSIVs and MSIV bypass valves.
	BOP	2) **DISPATCH** operator to perform EA-1-1, Closing MSIVs Locally, for any MSIV or MSIV bypass valve which fails to close.
	BOP	3) **ISOLATE** steam header:
		• **PLACE** condenser steam dumps in OFF. [M-4]
		• **ENSURE** steam dump valves CLOSED. [M-4]
		• **CLOSE** FCV-47-180, HP Steam Seal Supply Isolation. [M-2]
		• **ENSURE** FCV-47-181 HP Steam Seal Supply Bypass CLOSED. [M-2]
		• **CLOSE** MSR HP steam supply isolation valves. [M-2]
		• **DISPATCH** operator to locally isolate steam header **USING** EA-1-4, Local Isolation of Steam Header in Turb Bldg.

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
E-3, Steam Generator Tube Rupture		
	BOP	4) **USE** Intact S/G(s) atmospheric relief for steam dump.
Critical Task	BOP	5. **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
	BOP	6. **VERIFY** Ruptured S/G ISOLATED from Intact S/G(s):
		a. **CHECK** narrow range level greater than 10% [25% ADV].
		• 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.
	BOP	b. **CHECK** S/G #1 or S/G #4 ruptured.
	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
	BOP	7. **CHECK** Ruptured S/G pressure greater than 550 psig (<u>Unit 1</u>) or 425 psig (<u>Unit 2</u>).
	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.
		8. **INITIATE** RCS cooldown:
	BOP/	a. **DETERMINE** target core exit T/C temperature based on Ruptured

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">E-3, Steam Generator Tube Rupture</td></tr>
<tr><td></td><td>SRO</td><td>S/G pressure:</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Lowest Ruptured S/G pressure (psig)</th><th>Target Core Exit T/C Temp (°F)</th></tr>
<tr><td>1100 or greater</td><td>497</td></tr>
<tr><td>1050 - 1099</td><td>492</td></tr>
<tr><td>1000 - 1049</td><td>486</td></tr>
<tr><td>950 - 999</td><td>480</td></tr>
<tr><td>900 - 949</td><td>473</td></tr>
<tr><td>850 - 899</td><td>467</td></tr>
<tr><td>800 - 849</td><td>460</td></tr>
<tr><td>750 - 799</td><td>453</td></tr>
<tr><td>700 - 749</td><td>445</td></tr>
<tr><td>650 - 699</td><td>437</td></tr>
<tr><td>600 - 649</td><td>428</td></tr>
<tr><td>550 - 599</td><td>419</td></tr>
<tr><td>500 - 549</td><td>410</td></tr>
<tr><td>450 - 499</td><td>399</td></tr>
<tr><td>425 - 449</td><td>393</td></tr>
</table>
</td></tr>
<tr><td></td><td>BOP/ RO</td><td>b. WHEN RCS pressure less than 1960 psig, THEN PERFORM the following:</td></tr>
<tr><td></td><td></td><td>1) BLOCK low steamline pressure SI.</td></tr>
<tr><td></td><td></td><td>2) CHECK STEAMLINE PRESS ISOL/SI BLOCK RATE ISOL ENABLE permissive LIT. [M-4A, A4]</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP/ Crew</td><td>c. DUMP steam to condenser from Intact S/G(s) at maximum achievable rate:…
<i>(RNO required</i>-- MSIVs closed)</td></tr>
<tr><td></td><td>BOP</td><td>c.- IF steam dumps NOT available, THEN OPEN atmospheric relief valves or Intact S/G(s)
RAISE AFW flow to intact S/Gs as necessary to support cooldown.
IF local control of atmospheric reliefs… N/A
IF NO Intact S/G available… N/A</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO</td><td>d. WHEN core exit T/Cs less than target temperature determined in Substep 8.a,</td></tr>
</table>

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Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
E-3, Steam Generator Tube Rupture		
		THEN PERFORM the following:
	BOP	1) **CLOSE** steam dumps or S/G atmospheric reliefs to stop cooldown.
	BOP	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.
	BOP	3) **MAINTAIN** core exit T/Cs less than target temperature **USING** steam dumps or atmospheric reliefs.
	BOP	9. **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	10. **MONITOR** pressurizer PORVs and block valves:
		a. Power to block valves AVAILABLE
		b. Pressurizer PORVs CLOSED
		c. At least one block valve OPEN.
	RO	11. **RESET** SI signal.
	Crew	12. **MONITOR** AC busses energized from start busses.
	RO	13. **ENSURE** Phase A and Phase B RESET.

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Event Description:
SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
		E-3, Steam Generator Tube Rupture
	RO	14. **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.
		15. **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. ***(RNO for reference)***
		RNO: **IF** RCS pressure dropping uncontrolled, **THEN START** RHR pumps.
Evaluator Note:		**Critical Task** is to Cooldown RCS to less than or equal to target temperature prior to RCS depressurization
		16. **CHECK** if RCS cooldown should be stopped:
Critical Task		a. **CHECK core exit T/Cs less than target temperature determined in Substep 8.a.**
		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.
		17. **CHECK** Ruptured S/G(s) pressure STABLE or RISING.
		18. **CHECK** RCS subcooling based on core exit T/Cs greater than 60°F.
		19. **DEPRESSURIZE** RCS to minimize break flow and to refill pressurizer:
		a. **CHECK** normal pressurizer spray AVAILABLE.
		b. **INITIATE** maximum available pressurizer spray.

Op Test No.: NRC 2010302 Scenario # 4 Event # 7, 8, 9 Page 36 of 44

Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
E-3, Steam Generator Tube Rupture		
		c. **CHECK** depressurization rate ADEQUATE.
Evaluator Note: **Critical Task:** Equalize pressure between RCS and ruptured SG to stop primary to secondary leakage (40 minutes) **START TIME:** ____________ **END TIME:** ____________		
Critical Task		d. **CONTINUE depressurization UNTIL any of the following conditions SATISFIED:**
		• **Both of the following:** 1) **RCS pressure less than Ruptured S/G(s) pressure** **AND**
		2) **Pressurizer level greater than 10% [20% ADV].** **OR**
		• **Pressurizer level greater than 65%.** **OR**
		• **RCS subcooling based on core exit T/Cs less than 40°F.**
Console Operator Note: When spray valve is completely open in next step, insert malfunction to fail Loop 2 spray valve full open **(Key 6)**.		
Evaluator Note: **BOTH** Pzr Spray Valves are failed open following operator-demanded positioning; Crew implements RNO to stop RCPs as necessary; 2 RCPs, #s 1 & 2 should be adequate to stop the pressure decay.		
		e. **CLOSE** spray valve(s):
	RO	1) Normal spray valves ***(RNO required)***
Evaluator Note: **Critical Task:** Terminate RCS depressurization prior to losing RCS Subcooling is accomplished by stopping RCPs as procedurally directed in the following step.		
Critical Task	RO	**RNO:** 1) **STOP** RCPs #1 and 2. **IF** RCS pressure continues to drop, **THEN STOP** additional RCP as necessary.
	RO	2) Auxiliary spray valves.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	7, 8, 9	Page	37	of 44

Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
		E-3, Steam Generator Tube Rupture
	RO	f. **GO TO** Caution prior to Step 22
Evaluator Note:		**The following PORV depressurization steps are included as the crew may decide, based on their procedural pace to this point, that Pzr Spray Flow depressurization rate is inadequate and, therefore use the Pzr PORVs to complete the RCS depressurization.**
	CAUTION:	• **Depressurizing the RCS using a pressurizer PORV may cause PRT rupture with resulting abnormal containment conditions.**
		• **Excessive cycling of a pressurizer PORV increases the potential for PORV failure.**
	NOTE:	Upper head voiding may occur during RCS depressurization if no RCPs are running. This may result in rapidly rising pressurizer level
		20. **DEPRESSURIZE** RCS **USING** one pressurizer PORV to minimize break flow and to refill pressurizer:
		a. **CHECK** at least one pressurizer PORV AVAILABLE
		b. **OPEN** one pressurizer PORV UNTIL any of the following conditions SATISFIED:
		• Both of the following: 1) RCS pressure less than Ruptured S/G(s) pressure **AND**
		2) Pressurizer level greater than 10% [20% ADV]. **OR**
		• Pressurizer level greater than 65%. **OR**
		• RCS subcooling based on core exit T/Cs less than 40□F.
		c. **CLOSE** pressurizer PORV.
		d. **CLOSE** spray valve(s):
	RO	1) Normal spray valves ***(RNO required)***
	RO	**RNO:** 1) **STOP** RCPs #1 and 2. **IF** RCS pressure continues to drop, **THEN STOP** additional RCP as necessary.

Op Test No.:	NRC 2010302	Scenario #	4	Event #	7, 8, 9	Page	38 of 44

Event Description: SGTL increases to SGTR requiring Rx Trip and Safety Injection;
#1 SG MSIV Auto/Manual close failure;
Both Pzr Spray Valves fail full open during RCS depressurization in E-3

Time	Position	Applicant's Actions or Behavior
		E-3, Steam Generator Tube Rupture
	RO	2) Auxiliary spray valves.
		21. **CHECK** RCS pressure RISING
	CAUTION:	**Any delay in terminating SI after termination criteria are met may cause Ruptured S/G(s) overfill.**
		22. **CHECK** if ECCS flow should be terminated:
		• RCS subcooling based on core exit T/Cs greater than 40°F.
		• Secondary heat sink:
		• Narrow range level in at least one Intact S/G greater than 10% [25% ADV] **OR**
		• Total feed flow to S/Gs greater than 440 gpm AVAILABLE
		• RCS pressure STABLE or RISING.
		• Pressurizer level greater than 10% [20% ADV].
		23. **STOP** the following ECCS pumps:
		a. **STOP** SI pumps and **PLACE** in A-AUTO.
		b. **CHECK** offsite power supplying shutdown boards
		c. **STOP** all BUT one CCP and **PLACE** in A-AUTO.
		24. **ISOLATE** CCPIT:
		a. **CLOSE** inlet isolation valves FCV-63-39 and FCV-63-40.
		b. **CLOSE** outlet isolation valves FCV-63-26 and FCV-63-25.
Scenario may be terminated at E-3 Step 24, RCS depressurization and CCPIT isolation		

Op Test No.: NRC 2010302 Scenario # 4 Event # ES-0.5 Page 39 of 44

Event Description: Equipment Verification

Time	Position	Applicant's Actions or Behavior
ES-0.5, EQUIPMENT VERIFICATIONS		
Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken) to SRO.		
	BOP	1. **VERIFY** D/Gs RUNNING.
	BOP	2. **VERIFY** at least four ERCW pumps RUNNING
	BOP	3. **VERIFY** CCS pumps RUNNING
		1. Pump 1A-A (2A-A) Must Manually Start 2. Pump 1B-B (2B-B) 3. Pump C-S.
	BOP	4. **VERIFY** EGTS fans RUNNING.
	BOP	5. **VERIFY** generator breakers OPEN.
	BOP	6. **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.		

Op Test No.:	NRC 2010302	Scenario #	4	Event #	ES-0.5	Page	40	of 44
Event Description:	Equipment Verification							

Time	Position	Applicant's Actions or Behavior
	BOP	7. 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	8. **VERIFY** MFW Isolation: a. MFW pumps TRIPPED • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	9. **MONITOR** ECCS operation:
		a. **VERIFY** ECCS pumps RUNNING: • CCPs: • RHR pumps • SI pumps
		b. **VERIFY** CCP flow through CCPIT.
		c. **CHECK** RCS pressure less than 1500 psig.
		d. **VERIFY** SI pump flow.
		e. **CHECK** RCS pressure less than 300 psig.
		f. **VERIFY** RHR pump flow.
	BOP	10. **VERIFY** ESF systems ALIGNED:
		a. Phase A ACTUATED: • PHASE A TRAIN A alarm LIT [M-6C, B5]. • PHASE A TRAIN B alarm LIT [M-6C, B6].
		b. Cntmt Vent Isolation ACTUATED: • CNTMT VENT ISOLATION TRAIN A alarm LIT [M-6C, C5]. • CNTMT VENT ISOLATION TRAIN B alarm LIT [M-6C, C6].

Op Test No.:	NRC 2010302	Scenario #	4	Event #	ES-0.5	Page	41 of 44
Event Description:	Equipment Verification						

Time	Position	Applicant's Actions or Behavior
		c. Status monitor panels: • 6C DARK • 6D DARK • 6E LIT OUTSIDE outlined area • 6H DARK • 6J LIT.
		d. Train A status panel 6K: • CNTMT VENT GREEN • PHASE A GREEN
		e. Train B status panel 6L: • CNTMT VENT GREEN • PHASE A GREEN
	BOP	11. **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.

Op Test No.: NRC 2010302 Scenario # 4 Event # ES-0.5 Page 42 of 44

Event Description: Equipment Verification

Time	Position	Applicant's Actions or Behavior
		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.
		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.
		WHEN 10 minutes have elapsed, **THEN ENSURE** containment air return fans RUNNING.
	BOP	12. **CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors (attached) • Appendix B, Containment Rad Monitors. (attached)
	BOP	13. **CHECK** 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	14. **DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.

Op Test No.: NRC 2010302 Scenario # 4 Event # ES-0.5 Page 43 of 44

Event Description: Equipment Verification

Time	Position	Applicant's Actions or Behavior
	BOP	15. **ENSURE** plant announcement has been made regarding Reactor Trip and SI.

Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken, i.e.: manual Feedwater Isolation per ES-0.5 Step 8) to SRO.

END (ES-0.5, EQUIPMENT VERIFICATIONS)

Op Test No.:	NRC 2010302	Scenario #	1	Event #	Critical Task(s)	Page	44	of	44
Event Description:	Critical Task Listing								

Critical Tasks:	Critical Task Statement	Action Location	ESG pg #
1.	Isolate Steam flow and Feedwater flow to ruptured S/G prior to RCS Cooldown initiation.	E-3 Steps 4, 5	30
2.	Cooldown RCS to less than or equal to target temperature prior to RCS depressurization	E-3 Step 16.d	35
3.	Equalize pressure between RCS and ruptured SG to stop primary to secondary leakage (40 minutes)	E-3 Step 19.d	36
4.	Terminate RCS depressurization prior to losing RCS Subcooling	E-3 Step 19.e RNO 1)	36

TVA

Sequoyah Nuclear Plant

Unit 1 & 2

ESG-4

General Operating Instructions

0-GO-5

NORMAL POWER OPERATION

UFU
3AO
Today

Revision 0065

Quality Related

Level of Use: Continuous Use

Effective Date: 03-12-2010

Responsible Organization: OPS, Operations

Prepared By: W. T. Leary

Approved By: P. R. Simmons

Current Revision Description

Revised to address requirements overlooked in the initial issuance of the guidance for compliance with NERC Reliability Standards, VAR-002. These changes make no alteration to the operation of any equipment and are changes to required administrative notifications only. These changes are therefore minor editorial changes as defined in SPP-2.2.

PERFORMANCE OF THIS PROCEDURE IMPACTS REACTIVITY.

Table of Contents

ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

This General Operating (GO) Instruction provides guidance for power ascension from approximately 30 to 100% power, at power conditions, power reduction from 100 to 30% power, Power Coastdown at End of Life operations, and Load Follow operations.

This instruction provides additional guidance for turbine control restoration following a turbine runback.

1.2 Scope

This GO contains the following sections:

5.1 Power Ascension From 30% Power to 100%

5.2 At Power Conditions

5.3 Power Reduction From 100% to 30%

5.4 Power Coastdown at End of Life

5.5 Load Follow Operations

2.0 REFERENCES

2.1 Performance References

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

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

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

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

E. 1,2-SO-2-9, *Condenser Vacuum and Turbine Steam Seal Systems Operation*

F. 0-SO-12-1, *Auxiliary Boiler System*

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

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

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

J. 1,2-SO-62-1, *Chemical and Volume Control System*

K. 0-SO-62-7, *Boron Concentration Control*

L. 1,2-SO-62-9, *CVCS Purification System*

M. 0-SO-68-3, *Pressurizer Spray and Heater Pressure Control System*

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

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

P. 0-SI-OPS-092-078.0, *Power Range Neutron Flux Channel Calibration By Heat Balance Comparison*

Q. 0-SI-CEM-000-050.0, *72-Hour Chemistry Requirements*

R. 0-SI-CEM-030-407.2, *Radioactive Gaseous Waste Effluent Particulate and Iodine Dose Rates from Shield and Auxiliary Building Exhausts (Weekly/Special) and Condenser Vacuum Exhausts (Special)*

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

T. 0-SI-OPS-000-001.0, Initial Startup System Parameter Log

U. TI-40, *Determination of Preconditioned Reactor Power*

2.1 Performance References (continued)

V. 2-SO-98-1, *Distributed Control System*

2.2 Developmental References

A. Memorandum from System Engineering concerning MSR operation - RIMS S57 880322 999

B. Memo from Reactor Engineering - RIMS S57 941219 934

C. S57-880322-999 and S57-880808-851

D. W Letter GP89-076 (RIMS No. S53 890427 984)

E. W Letter GP 89-155 (RIMS S57 891026 972)

F. W Letter GP 86-02(B44 861112 002)

G. SSP-2.3, *Administration of Site Procedures*

H. TVA-NQA-PLN89-A

I. GOI-10, *Reactivity Control at End of Cycle Life* (Trojan Nuclear Plant)

J. FSAR, Section 13.5

K. Memo from Reactor Engineering - August 6, 1996 (G Bair)

L. NERC Reliability Standard, VAR-002-1.1b

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

A. To ensure that NIS Reactor Power level indications remain within 2% of true power during power level changes, a check should be performed about every 20% power level change, when greater than 15% power, by comparing calorimetric power to each NIS Power Range drawer. The 20% power level check does not preclude the operating crews from making necessary changes in response to changing plant conditions.

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 or equal to 250°F.

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

C. The following should be used to determine the most accurate reactor power indication for comparison with NIS:

- When reactor power is greater than 15%, use LEFM calorimetric power indication (U2118).
- If LEFM is NOT available, then use average loop ΔT (UO485 or M-5 indicators) up to 40%. Above 40%, use computer point U1118.

D. 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 Ltr GP 89-155; RIMS S57 891026 972)

E. Pressurizer heaters and sprays may be operated as required to maintain pressurizer and RCS boron concentration within 50 ppm. If loop boron concentration is changed by 20 ppm or greater, use the pressurizer backup heaters to initiate automatic spray (if available). If Normal Spray is NOT available, then use Auxiliary Spray (1, 2-SO-62-1, Section 8.7) in conjunction with pressurizer backup heaters.

3.1 Precautions (continued)

F. Condensate DI polishing operations during power ascension are controlled by staying within system parameters and by recommendations from the Chemistry Section.

G. The valve position limiter should be periodically positioned approximately 10% above the current governor control indications (keeps governor valves off of the limiter) as turbine load is changed. 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.

H. Any off-frequency turbine operation is to be reported to Engineering for record keeping. The report will include duration and magnitude of off-frequency operation.

I. 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.

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

K. Initial Startup After Refueling - 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 at the following RTP hold points. Reactor Engineering and/or Systems Engineering will determine procedure performance. [C.3]

1. At < 50% RTP a flux map and single point alignment, a hot channel factor determination, an axial imbalance comparison, and a PR NIS calibration will be performed. The PR high range trip setpoint will then be increased to its normal value of 109%.

2. At < 75% RTP, calorimetric calculations and RCS flow verification may be performed, EAGLE-21 updated prior to increasing power, a flux map, a hot channel factor determination, an axial imbalance comparison may be required if not performed at < 50%, a detector calibration (if Δ AFD $\geq$ 3%), and a PR NIS calibration may be performed.

3.1 Precautions (continued)

3. If not performed at 75% hold point, an axial imbalance comparison and a detector calibration (if Δ AFD ≥ 3%) should be performed at ~ 100% RTP. Engineering will determine if PR NIS calibration must be performed. Calorimetric calculations, RCS flow verification, a hot channel factor determination, and a reactivity balance will be performed and EAGLE-21 updated. Reactor Engineering will notify Operations that normal full power operations may proceed.

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

5. 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.

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

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

   b. 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.

   c. 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.*

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

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

L. Declared fuel defects, as determined by the Fuel Reliability Assessment Team or the Shift Manager, have limited ramp rates during Reactor Power increases as specified in TI-40.

M. TI-40 power increase limits that are exceeded, in any one hour, are evaluated in accordance with SPP-3.1.

3.1 Precautions (continued)

N. Power Coastdown At End Of Life:

1. Reactor power changes should be limited to less than or equal to 1% per hour to avoid causing xenon peaking which could force a plant shutdown.

2. Do not perform unnecessary unit power maneuvers or testing (e.g., turbine valve testing). Such testing could result in an uncontrollable Xenon oscillation.

3. Nonessential work on systems which could cause a plant upset should be deferred.

4. Secondary Plant runbacks such as Main Feed Pump Turbine trip or #3 Heater Drain Tank runback will require a unit shutdown if Reactor power is not promptly returned to pre-transient level due to the resulting severe Xenon transient. If a system power alert is in effect, and electrical generation is critical, unit load should be reduced as necessary keeping T_{AVG} on program. Contact Reactor Engineering for an evaluation and guidance concerning unit shutdown or reduction of load.

5. Management should be consulted to evaluate the feasibility of a unit restart if a reactor trip occurs with RCS equilibrium boron concentration less than 50 ppm. If the reactor is to be restarted, the power level shall be limited to nominal pre-trip power level.

O. Axial Flux Difference Management:
When the reactor is operating at a steady power or during normal load changes, maintain ΔI within the operating limits of the Core Operating Limits Report (COLR). It is recommended that the core axial flux difference (AFD) be maintained within ± 5% of the target band at all times, excluding the performance of 0-PI-NUC-092-036.0, "Incore - Excore Calibration," and End of life power coast downs. Operating time outside the band, which is given in TI-28 Attachments 1 and 2, should be minimized. Reactor Engineering should be contacted if time out of the ± 5% target band exceeds approximately 30 minutes.

P. The position of control 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 5 steps below this guidance for long term, then impact may occur to safety analysis assumptions.

Q. During heatup and cooldown transients, RCS density changes will cause changes in NIS indicated power. At constant reactor power, a 1°F change in T_{AVG} may cause as much as a 1% (or more) change in indicated NIS power.

3.1 Precautions (continued)

R. The following limitations are applicable to Unit Two ONLY. N/A

1. N/A In winter months #7 HDTP capacity is not adequate to pump #6 Heater drains when all Condensate Demineralizer pumps are in service. Current practice is to run two Cond DI Pumps and / or throttle the condensate system to reduce backpressure. The preferred method is to throttle condensate pressure instead of running only two Condensate Demineralizer booster pumps at full power due to pump runout concerns.

2. Siemens-Westinghouse analysis has determined that the maximum unit power with one MFP operation is 65% under worst case conditions. The plant could operate higher if plant conditions permit.

3. MFP flow from the lead MFP should not exceed 53.7% of the total flow. Flow rates above this would result in HP steam flow to the lead MFPT. Computer points 1(2)UO504 and UO505 can be used to monitor.

S. Voltage Control

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Operation of the Main Generator without Automatic Voltage Control could impact grid voltage requirements. Refer to GOI-6 for MVAR limits.

2. When the Main Generator is connected to the grid, the voltage regulator shall be operated in Automatic, unless coordinated with the Transmission Operator (SELD).

3. Main Generator operation outside of the Transmission Voltage Schedule requires coordination with the Transmission Operator, and notation in the operator's Log of time, reason, and that the Transmission Operator notification was made.

4. When directed to modify voltage, the Generator Operator shall comply (within plant procedural requirements) or provide an explanation of why the schedule cannot be met.

5. While the Main Generator is tied to the grid perform the following:

    a. The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between AUTO and Manual as soon as practical but notification shall be within 30 minutes.

3.1 Precautions (continued)

b. The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfers between Manual and Auto.

c. All position changes (to and from Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration and notifications made.

f. Reliability Directives and Protective Relay/Equipment Failures

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Plant Operations shall notify the Transmission Balancing Authority (BA) or Transmission Operator of protective relay or equipment failures that creates a creditable risk to Plant Generation. A creditable risk to generation represents a potential reduction in transmission system reliability.

2. Reliability Directives to the Generator Operator are via the Balancing Authority or Transmission Operator. Required action time may range from immediate to no longer than 30 minutes. Actions shall be taken without delay. The directives may be associated with preventing or clearing Local System issues, or neighboring system issues.

3. Plant operations shall take timely actions as directed by the Balancing Authority or Transmission Operator to mitigate critical conditions to return the bulk electrical system to a reliable state. Plant operations shall comply with Balancing Authority or Transmission Operator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements.

4. Plant Operations shall immediately inform the Balancing Authority or Transmission Operator of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

3.2 Limitations

A. When the axial flux difference monitor alarm is inoperable, the AFD must be logged every hour by performing 0-SI-NUC-000-044.0.

(SR 4.2.1.1.a.2 & 4.2.1.1.b)

B. When both the plant computer and NIS QPTR alarm systems are inoperable, the QPTR must be calculated every 12 hours by performing 0-SI-NUC-000-133.0. (SR 4.2.4.1.b)

C. Do not exceed a load change rate of plus or minus 5% per minute or a step change of 10%.

D. River water temperatures shall be maintained within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0.

NOTE

Westinghouse should be contacted if the turbine is operated outside of its operating limits as stated below.

E. To prevent high vibratory stresses and fatigue damage to the last stage turbine blading, do not operate the turbine 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)
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.

F. Do not allow the generator to become underexcited.

G. 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 0-SI-CEM-000-050.0, 0-SI-CEM-030-407.2 and 0-SI-CEM-000-415.0 due to the thermal power change.

3.2 Limitations (continued)

H. The following Main Turbine vibration limitations and actions should be adhered to:

  1. Vibration levels which exceed 7 mils (alarm setpoint) should be verified by Predictive Maintenance Group.

  2. Vibration levels greater than 7 mils and less than 14 mils should be continuously monitored by Predictive Maintenance Group.

  3. IF vibration level is greater than or equal to 14 mils, THEN TRIP the turbine.

I. Westinghouse recommends that if any throttle valve is held closed for more than 10 minutes, then it should be re-tested immediately upon reopening in accordance with 1,2-PI-OPS-047-002.0.

J. The generator may be operated without a bus duct cooler up to approximately 729 MW turbine load.

K. To ensure sufficient voltage for a safe shutdown after loss of both units, voltage and reactive power should be maintained within the limits of GOI-6.

L. With LEFM calorimetric power indication available, full power operation is defined as approximately 3455 MW_T not to exceed 3455.0 MW_T averaged over a 8-hour period. [C.1] If LEFM is available, power shall be monitored using plant computer point U2118 Instantaneous Value. **DO NOT** allow average thermal power to exceed 3455 MW thermal for two consecutive hours. Every effort should be made to maintain core thermal power 10 minute average less than 3455 MWt.

M. The following restrictions apply if LEFM calorimetric power indication (U2118) is unavailable:

  1. Applicable action of TRM 3.3.3.15 must be entered.

  2. AFD limits in COLR and TI-28 must be made more restrictive by 1%.

  3. Rod insertion limits in COLR must be raised by 3 steps.

  4. If reactor power is greater than 40%, power should be monitored using U1118. If U1118 is also unavailable, use the highest reading NIS channel.

  5. If reactor power is less than 40%, use the RCS average ΔT as the preferred method for determining power level.

3.2 Limitations (continued)

N. IF equilibrium conditions are achieved, after exceeding by 10% or more of rated thermal power the thermal power at which the heat flux hot channel factor was last determined, THEN conditional performance of 0-SI-NUC-000-126.0, Hot Channel Factor Determination is required.

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. With one LP heater string out of service (isolated), power is limited to 86% (Unit 1) or 90% (Unit 2). This is based on LP turbine blading limitations. (Ref: DCN E21203A).

Q. #3 heater drain tank should remain drained with LCV-6-105A and B failed open (per 1, 2-SO-5-2) until reactor power exceeds ~45-50%. This will prevent intermediate heater string isolations if a turbine trip occurs at lower power levels. If a level is established in the number 3 Heater Drain Tank prior to exceeding P-9 setpoint (50% power), a turbine trip will result in Intermediate Pressure Heater string isolation(s).

STARTUP No. 1 Unit 1 Date today

4.0 PREREQUISITES

NOTES

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

2) Prerequisites may be completed in any order.

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

[2] T_{AVG} is being maintained within 1.5°F of T_{REF}. ☑

[3] SG level controls are being maintained in AUTO (**N/A** if auto control **NOT** available). ☑

[4] Control rods are being maintained within the operating band of Core Operating Limits Report (COLR) (**N/A** if shutting down due to dropped or misaligned rod). ☑

[5] Steam dump control system is in the T_{AVG} mode (**N/A** if Tavg Mode **NOT** available). ☑

[6] The EHC system should be in OPER AUTO (pushbutton lit). ☑

[7] Generator pressurized with hydrogen according to capability curve. (TI-28, Fig. A.I4) ☑

[8] PRMs are being maintained within ±2% of core thermal power readings. ☑

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 No. 1 **Unit** 1 **Date** today

4.0 PREREQUISITES (continued)

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

Print Name	Initials

STARTUP No. 1 **Unit** 1 **Date** today

5.2 At Power Conditions

CAUTIONS

1) Full power operation is defined as approximately 3455 MWT NOT to exceed 3455.0 MWT averaged over an 8-hour period. [C.1]

2) Power shall NOT exceed one hour average (U2125) of 3455.00 MWT.

3) Power shall NOT exceed an 8-hour average value (U2126) of 3455.00 MWT (readings at 0700, 1500 and 2300 hours).

NOTES

1) Failure to comply with the following NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.

2) The Transmission Operator shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]

3) The Transmission Operator shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.

4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.

5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.

6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made

7) 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 30 minutes.

8) Steps in this section may be performed out of sequence.

[1] **ENSURE** Section 3.0, Precautions and Limitations, have been reviewed. SDO

[2] **TREND** Computer point U2118 on a trend recorder in the unit horseshoe and monitor for increasing reactor power trends above 3455 MW_T. ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

[3] **IF** increasing power trend is observed, **THEN**

ENSURE PROMPT action is taken to decrease reactor power as necessary. [C.1]

_____ 1st

_____ CV

NOTE

Examples of activities which may cause a rise in Reactor power include, but are not limited to RCS dilution, S/G flow changes, TDAFWP testing, secondary plant activities which impact feed flow or temperature and/or RCS pressure changes.

[4] **IF** any preplanned activity will be performed which is expected to cause a transient increase in thermal power,
THEN
REDUCE turbine load and/or insert negative reactivity (using control rods or boration) prior to starting activity as necessary to ensure 10 minute average power (U2221RA or U1118RA) will not exceed 3455 MWt.

_____ 1st

_____ CV

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

CAUTION

If LEFM is lost with reactor power at 100%, core thermal power should NOT be raised to take advantage of U1118 reading lower.

NOTE

The following restrictions apply if LEFM calorimetric power (U2118) is unavailable:

- Applicable action of TRM 3.3.3.15 must be entered.
- AFD limits in COLR and TI-28 must be made more restrictive by 1%.
- Rod insertion limits in COLR must be raised by 3 steps.

[5] **IF** ICS point U2118 is unreliable or unavailable,
THEN
PERFORM the following:

[5.1] **MONITOR** thermal power by using one of the following:

- ICS point U1118 (if available) ☐
- highest reading NIS power range channel. [C.1] ☐

[5.2] **RESTORE** calorimetric power indication prior to next required performance of 0-SI-OPS-092-078.0. ☐

[5.3] **IF** LEFM CANNOT be restored prior to 0-SI-OPS-092-078.0 being required,
THEN

ENSURE power is less than or equal to 98.7% (3411 MW_T) prior to performing 0-SI-OPS-092-078.0:

- **REDUCE** turbine load as necessary. ☐
- **MAINTAIN** T_{AVG} and AFD on program using boration and/or rod insertion as necessary. ☐

[5.4] **PERFORM** 0-SI-OPS-092-078.0 using U-1118 or alternate method. ☐

STARTUP No. 1 **Unit** 1 **Date** Today

5.2 At Power Conditions (continued)

[5.5] **MAINTAIN** power less than or equal to 98.7% (3411 MWT) UNTIL LEFM is restored and 0-SI-OPS-092-078.0 is re-performed using LEFM data. ☐

[6] **MAINTAIN** rod control system in automatic to allow proper plant response to load reductions and runbacks. ☐

[7] **DURING** steady state operation ≥ 85% RTP **MAINTAIN** control bank D greater than 215 steps if possible and AFD within the nominal ± 5% target band and also within the AFD limits specified in the COLR. ☐

[8] **DURING** steady state operation < 85% RTP **MAINTAIN** control bank D greater than 165 steps if possible and the axial flux difference (AFD) within the nominal ± 5% target band and also within the AFD limits specified in the COLR. ☐

[9] **OPERATE** the turbine in IMP OUT due to inherent system swings during operation in IMP IN. (Operation in IMP IN is permitted during governor valve testing.) ☐

NOTE

Valve position limiter should normally be maintained ~ 2% above governor valve position unless load swings occur.

[10] **IF** unsatisfactory load swings are observed, **THEN**

ADJUST governor valve position limiter as necessary to limit governor valve motion.

_____ 1st _____ CV

STARTUP No. 1 Unit 1 Date Today

5.2 At Power Conditions (continued)

CAUTION

Do NOT raise the limiter position unless the turbine control is positively controlling the turbine (limit light NOT LIT).

[11] **IF** governor valve motion limiting is no longer needed, **THEN**

[11.1] **ADJUST** SETTER/REFERENCE controls to reduce turbine loading until the VALVE POS LIMIT light is NOT LIT. ☐

[11.2] **INCREASE** VALVE POS LIMITER setpoint to ~ 2% above current load, ENSURING load does NOT change. ☐

[12] **IF** an axial xenon oscillation develops and requires suppression, **THEN**

[12.1] **MOVE** control bank inward when AFD is moving positive above target AFD, **OR**

[12.2] **MOVE** control bank outward when AFD is moving negative below target AFD, **AND**

HOLD AFD at target until oscillation is suppressed. ☐

[12.3] **IF** this basic first overtone control is insufficient, **THEN**

CONTACT Reactor Engineering for assistance. ☐

STARTUP No. 1 **Unit** 1 **Date** TB day

5.2 At Power Conditions (continued)

NOTE

Lowering load on the Main Generator will cause VARs to trend in the positive direction (toward outgoing). This will require lowering generator voltage. Conversely, raising generator load will cause VARs to trend in the negative direction and will require raising generator voltage. Refer to GOI-6 Section E for MVAR limits for generator stability. Refer to precautions R, S,T and V.

[13] **PERFORM** the following as required:

[13.1] IF Automatic Voltage Control is in service,
THEN
ADJUST Main Generator VARs **USING** **[HS-57-22]** Exciter Voltage Auto Adjuster as necessary during power escalation. ________

[13.2] **IF** necessary to remove Automatic Voltage Control from service,
THEN
PERFORM required steps in Appendix E. ________

[13.3] IF Automatic Voltage Control is NOT in service,
THEN
ADJUST Main Generator VARs **USING** **[HS-57-23]** Exciter Voltage Base Adjuster as necessary during power escalation. ________

STARTUP No. 1 Unit 1 Date Today

5.2 At Power Conditions (continued)

NOTES

1) Deboration using a mixed bed demin is normally used when less than 50 ppm but may be used between 50-100 ppm if recommended by Chemistry or if required due to dilution capability NOT available.

2) Every effort to maintain core thermal power 10 minute average less than 3455 MWt should be made. Core thermal power one hour average SHALL not exceed 3455 MWt.

[14] **PERFORM** the following as necessary to maintain T-avg and thermal power at desired value:

[14.1] **ADJUST** RCS boron concentration in accordance with 0-SO-62-7, Boron Concentration Control ☐
OR

[14.2] **ADJUST** control rod position in accordance with 0-SO-85-1, Control Rod Drive System ☐
OR

[14.3] **ADJUST** turbine load slightly ☐
OR

[14.4] **DEBORATE** RCS periodically using a mixed bed demin in accordance with 1,2-SO-62-9 (if RCS boron less than 100 ppm) ☐

[15] **IF** core thermal power 10 minute average exceeds 3455 MWt **OR** an increasing power trend which will exceed 3455 MWt is observed, **THEN**
ENSURE PROMPT action is taken to decrease reactor power as necessary. [C.1]

____
1st

____
CV

STARTUP No. 1 Unit 1 Date Today

5.2 At Power Conditions (continued)

NOTE

Appendix D provides recommended power values for maintaining condensate pressure if secondary plant equipment must be removed from service for maintenance.

[16] **IF** unit shutdown or load reduction is required, **THEN**

GO TO Section 5.3 of this instruction. ______

[17] **IF** Load Follow is required, **THEN**

PERFORM Section 5.5, *Load Follow Operations.* ______

[18] **IF** at end of cycle and a power coastdown is required, **THEN**

PERFORM Section 5.4, *Power Coastdown At End Of Life.* ______

END OF TEXT

Facility: Sequoyah Scenario No.: 6 Op Test No.: 1020302

Examiners: Operators:

Initial Conditions: 75% Power.

Turnover: Maintain 75% RTP for Incore Flux Mapping per QPTR Tech Spec concerns; 1A-A MDAFW Pump OOS

Target CTs: Manually isolate/verify feedwater isolation prior to SG(s) inventory loss (Time critical action)
Manually Stop RCPs prior to FR-H.1 Step 9 completion

Event No.	Malf. No.	Event Type*	Event Description
1. T+0	SI02A	C – RO TS – SRO	Cold Leg Accumulator Nitrogen Leak
2. T+10	RX11B	I – RO TS – SRO	First Stage Pressure Transmitter PT-1-73 Fails High.
3. T+20	MS12D	C – BOP	Lp #4 SG Atmos. Relief Valve Fails Partially Open
4. T+30	FW18A	C – BOP	1A Main Feedwater Pump High Vibration
5. T+40	N/A	R – RO N –SRO/BOP	Plant Power Reduction
6. T+65	FW20 RP16K621A RP16K621B RP13A RP13B	M – All	Main Feedwater Header Break w/ Feedwater Isolation Failure
7. T+65	FW07B FW22B FW07C FW22C	M – All	1B-B MDAFW Fail to Auto Start, air/vapor bound pump TDAFW Pump trip/Vapor bound

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

Scenario 6 Summary

The crew will assume the shift at 75% Power with instructions to maintain 75% RTP per 0-GO-5 Section 5.1 Step 48 for Incore Flux Mapping for QPTR Tech Spec concerns.

After turnover, at Lead Examiner direction, insert a #1 Cold Leg Accumulator N2 leak. The crew will respond using alarm response procedures, (ARPs) 1-AR-M6-D A-1 which directs adjusting the pressure and/or level according to 1-SO-63-1, Cold Leg Injection Accumulators. SRO will identify Technical Specification 3.5.1.1.d Action a.

After Technical Specifications are addressed, at Lead Examiner direction, turbine first stage pressure transmitter, PT-1-73, Pimp Ch 1, will fail high. The crew will respond using ARP(s) 1-AR-M5-A C-6. The crew will respond to the automatic control rod motion by entering AOP-C.01, Rod Control System Malfunctions and perform the Immediate Operator Actions (IOAs) to stop the unexpected control rod motion. They then, transition to AOP-I.08, Turbine Impulse Pressure Instrument Malfunction to address the RCS temperature control, feedwater control and steam dump realignment (to steam pressure mode). SRO will identify to Technical Specification 3.3.1.1 Functional Unit 22E Action 8.b.

After Technical Specifications are addressed, at Lead Examiner direction, initiate the next malfunction, #4 SG Atmospheric Relief Valve fails open. The crew will respond using ARP(s) 1-AR-M5-A A-6, C-6 or 1-AR-M6-B D-7 and AOP-S.05, Steam Or Feedwater Leak which directs manual closure of the failed open relief valve and Tave-Tref deviation control.

At the Lead Examiner direction, 1A Main Feedwater Pump vibration will develop. The crew will respond using ARP(s) 1-AR-M3-B A-1, B-5 which will require a manual load reduction for MFP shutdown. If the crew decides to manually trip the MFP, the SRO should enter AOP-S.01, Main Feedwater Malfunctions Section 2.7, Main Feedwater Pump Trip Below 76% Turbine Load.

When the crew has stabilized the unit, at the Lead Examiner direction, a Main Feedwater Header Break (MFLB) outside containment occurs on the combined feed line downstream of the #1 HP Feedwater Heaters, upstream of the FWI Valves. The crew will respond using ARP(s) 1-AR-M5-A B-7 and AOP-S.05, Steam or Feedwater Leak. The leak will increase to the point that a reactor trip is required. The crew should evaluate and manually trip the reactor prior to any automatic reactor trip actuation.

When the reactor trips, will perform IOAs, enter E-0, Reactor Trip or Safety Injection and transition to ES-0.1, Reactor Trip Response. Once Status Tree monitoring is implemented, the crew will identify no auxiliary feedwater flow capability. Automatic Feedwater Isolation fails to occur requiring the crew to manually isolate the feed line break from the SGs.

1A-A MDAFW Pump is out of service and 1B-B MDAFW Pump and the TDAFW Pump both are air/vapor bound. Subsequently the TDAFW Pump trips on overspeed. The crew should manually stop 1B-B MDAFW Pump; venting is required to restore the pump. TDAFW Pump venting and T&T valve resetting are required to restore feedwater flow capability to SGs.

The scenario may be terminated, at the Lead Examiner direction when TDAFW Pump is restored and feeding the SG(s).

EOP flow: E-0 – ES-0.1 – FR-H.1 – ES-0.1

PSA significant transient: Loss of Feed & MFW Line Break
PSA significant action: Recovery of AFW (TDAFW Pump)

EVENT	IC/MF/RF/OR #	Description/Expected Actions/Booth Feedback
Simulator IC	IC-14 Perform switch check. PLACE the simulator in RUN before loading SCN file or starting the exercise. This will initialize ICS. **Load SCENS:** **1009 NRC ESG-6** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms	**75%, BOL ~1000 MWD/MTU** **CB 'D' Rods @ 185 steps, all others @ 228 steps;** **[B] = 1189 ppm; Ba Blender setting: 29%** **Xe: -2529 pcm; Sm: -1019 pcm;** ***Console Operator actions: Place simulator in run and perform the following:*** • **Allow the simulator to run before loading SCEN file.** • **Place the MODE 1 sign on 1-M-4** • **Place Train Week A sign**
MFs, RFs, ORs are active when the SCN file is loaded.	**IRF FWR34 f:1** **IOR ZDIHS3116AA f:0** **IMF RP16K621A f:1** **IMF RP16K621B f:1** **IMF RP13A f:1** **IMF RP13B f:1**	**1A-A MDAWFP OOS** **FWI Automatic Actuation Failure**
1.	**IMF SI02A f:1 k:1** **DMF SI02A**	**#1 CLA Lo-Pressure – Faulty Relief Valve;** (Faulty relief valve corresponds to 10 psi/minute decrease at 500 psid CLA-containment pressure.) *Support staff report: When requested, report as AUO N2 regulator aligned and set as expected.* **Prior to inserting Malfunction , ensure CLA pressure is being monitored;** **THEN:** ***Delete malfunction when CLA pressure drops to < 624 psig.***
2.	**IMF RX11B f:1 k:2**	**PT-1-73, Pimp Ch 1 fails low- no-load value;** *Support staff report:* *When MSS or IMs is contacted to trip bistables, inform the crew that the IMs will report to the MCR in ~45 minutes (WO package & briefing time).* Ch 1, PT-1-73 indicated on 1-M-4; directly affects the load reference Tref-. MCR indications are also reflected in the system responds to the Tref program low failure; – Steam Dump Cont Sys: will arm D solenoid, but dumps will not open since they are not armed; – Rod Cont Sys: no-load value- 547°F value; Rods will insert – SG Lvl Cont Sys: no-load value-~33% NR; – Crew may **NOT** place FWC in MANUAL, but may monitor AUTO control establish/ control level at no-load value.

EVENT	IC/MF/RF/OR #	Description/Expected Actions/Booth Feedback
3.	**IMF MS12D f:80 r240 k:3** **{ZDIHS131}DMF MS12D**	**Lp #4 SG Atmos. Relief Valve Fails Open** *<u>Support staff report</u>: if dispatched, Security, AUO(s), report steam coming out of the top of West Valve Vault Room.*
4.	**IMF FW18A f:80 d:15 k:4** **IOR ZAOPI4612 F:19.5 r:20 k:4** **IOR ZAOPI4617 F:165 r:15 k:4**	**1A MFW Pump Hi Vibration w/ an oil leak at the pressure transmitter.** *<u>Support staff report</u>: When dispatched to investigate, wait ~3 minutes, report MFP vibration is 7.1 mils above baseline and slowly trending up; an oil line is leaking but is containable to this elevation/surrounding area.* *If dispatched, when requested, report as Engineering or Predictive Maintenance that local vibration is 7 mils above baseline* • *If Environmental Controls and/or Fire Protection personnel are dispatched, wait 5 minutes for each and report on station and implementing appropriate supporting actions.*
	MMF FW18A f:100 d:15	*<u>Support staff report</u>: When requested, report MFP vibration is NOW off scale high and noticeable floor vibration can be felt.*
5.	**N/A**	**Plant power reduction following MFP trip** *<u>Support staff report</u>: If requested, AUO(s) report Relay lights are dark- **NOT** armed.*
6.	**IMF FW20 f:50 k:6**	**Feedwater line break in turbine building;** failure of common header, downstream of #1 FW Heater; *<u>Support staff report</u>: If dispatched, AUO(s) report TB inaccessible, excessive steam and loud noise.*
	IMF RP16K621A f:1 **IMF RP16K621B f:1** **IMF RP13A f:1** **IMF RP13B f:1**	**FWI Function fails: FWI Valves, FRVs/Byps fail to close automatically.**
Simulator Operator: DO NOT vent and/or reset AFW Pump(s) without Lead Examiner direction		
7.	**IMF FW09B f:1** **IMF FW22B f:1 e:1** **IMF FW07B f:1 d:180 e:1**	**1B-B AFW Pump AUTO-Start defeated;** **1B-B Air-bound AFW Pump;** **1B-B AFW Pump trip;** *<u>Support staff</u>: when dispatched, wait 2 minutes, report as TB AUO, the pump is hot to the touch.*
7.	**To Vent MDAFWP:** **DMF FW07B** **DMF FW22B**	*1B-B AFW Pump is air/vapor bound when the pump is started and indicates only no load current, no discharge flow; if AFW is required, no water will be added to S/Gs #3 & #4 until the pump is vented.*

EVENT	IC/MF/RF/OR #	Description/Expected Actions/Booth Feedback
7.	**IMF FW22C f:1 e:1** **IMF FW07C f:1 d:240 e:1**	**TDAFWP becomes air-bound when required to supply AFW flow and will trip ~4 minutes later.** *<u>Support staff report</u>: SEE next line.*
When directed by Lead Examiner, perform the following:	**DMF FW22C** **DMF FW07C**	**TO VENT & RESET** TDAFW Pump Mechanical Overspeed Trip & Airbound **To Vent: Delete TD Airbound & OvSpd Trip…THEN,** *<u>When directed by LEAD EXAMINER:</u> Report as AB AUO, notify the MCR that the TDAFW Pump has been vented and is ready to be reset, standing by [to receive direction to RESET]*
AND **Insert k:17**	**IRF FWR27 f:0 k:17**	**TDAFWPp Ovr Spd Reset**
Termination Criteria:	**Lead Examiner direction when TDAFW Pump is restored prior to RCS Feed and Bleed initiation criteria.**	

Unit 1 MCR CHECKLIST Page 1. of 3 Today

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

Mode 1, 76% Power
PSA Risk: YELLOW
Grid Risk: Green

RCS Leakage ID .02 gpm, UNID .02 gpm

NRC phone Authentication Code

Until 0800 XXXX
After 0800 YYYY

Common Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner
- none -	**- none -**	**----------**	**------**

U-1 Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner
TS LCO 3.7.1.2.a	1A-AMDAFW Pump	2 hours ago	MMG
TS 3.3.3.7.18.a action 1	1A-A MDAFWP ERCW - AFW Valve Position	2 hours ago	MMG

Protected Equipment

- Equipment/spaces for TDAFW Pump per 0-GO-16 Appx J

Shift Priorities

- *Power was reduced to 76% Rx Power (73% Turb load) ~36 hours ago for Incore Flux Mapping for QPTR Tech Spec concerns.*
- *Maintain current plant conditions until evaluation 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

SHIFT TURNOVER CHECKLIST Page 2. of 3 Today

MAIN CONTROL ROOM (7690)

- **Train _A_ Week**
- **Protected Equipment:**
    - **1-HS-1-51A-S, TDAFW Pump**
    - **MDAFW Pump B 1-HS-3-128A**
    - **D/G 1A-A 1-HS-57-46A**
    - **D/G 1B-B 1-HS-57-73A**

OUTSIDE (7666) [593-5214]

- ***All Equipment normal***
- ***Equipment/spaces for 1A-A MDAFW Pump protected per 0-GO-16 Appx J***

AUXILIARY BUILDING (7775)

- ***1A-A MDAFW Pump was tagged 2 hours ago to investigate/repair excessive coupling vibration. Expected Return to service is 8 hours. (WO 10-080026-000)***
- ***Equipment/spaces for 1A-A MDAFW Pump protected per 0-GO-16 Appx J***

TURBINE BUILDING (7771) (593-8455)

- ***All Equipment normal for current conditions***
- ***Equipment/spaces for 1A-A MDAFW Pump protected per 0-GO-16 Appx J***

SHIFT TURNOVER CHECKLIST Page 3. of 3 Today

Disabled Annunciators

PANEL	WINDOW	ANNUNCIATOR	WO / PER Number

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number

MCR WO LIST

ID And Noun Name	Panel	Problem Description	WO/PER Number

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1189** ppm Today	BA Controller Setpoint: **29%** *		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 189: **17** gallons of acid, **75** 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: **22**	Gallons of water: **94**	Rod Steps: **1**

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%	181 Steps on bank D	93 gallons
30%	161 Steps on bank D	291 gallons
50%	n/a	n/a

** 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 TODAY. Data Valid up to three weeks from now.

Previous Shift Reactivity Manipulations

Number of dilutions: 1	Number of borations:	Rod steps in:
Gallons per dilution: 12	Gallons per boration:	Rod steps out:
Total amount diluted: 12	Total amount borated:	Net change: IN/Out

Current Shift Estimated Reactivity Manipulations

Remarks: Rx Power ≈76% MWD/MTU – 1000 Xe: -2529 pcm; Sm: -1019 pcm;
***The boron letdown curve is flat for the next 25 EFPD.

Last Dilution Complete ~1 hour ago.

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

Unit Supervisor: ______________________
Name/Date

Operations Chemistry Information

Boron Results

Sample Point	Units	Boron	Date / Time	Goal	Limit
U1 RCS	ppm	1189	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	ppm	1.1	Today / Now	>1	>1
U2 RCS	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	115	Today / Now	68	Today / Now
15 gpd (30 min increase)	cpm	265	Today / Now	83	Today / Now
30 gpd leak equivalent	cpm	490	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	1165	Today / Now	455	Today / Now
150 gpd leak equivalent	cpm	2290	Today / Now	870	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cfm	40	Today / Now	40	Today / Now

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

Op Test No.: NRC 2010302 Scenario # 6 Event # 1 Page 1 of 46

Event Description: Cold Leg Accumulator Nitrogen Leak.

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or behavior</th></tr>
<tr><td colspan="3">Simulator Operator: No action required for Event 1</td></tr>
<tr><td colspan="3">Alarms/Indications
Annunciator:
1-M-6
• 1-XA-55-6D Window A-1, "PIS-63-126 ACCUMULATOR TANK 1 PRESSURE HI-LOW"

Indications
1-M-6
• 1-PIS-63-128, 63-126, NO. 1 CL ACCUM PRESSURE indicates a lowering pressure</td></tr>
<tr><td>T = 0</td><td>Crew</td><td>Respond to 1-M-6 alarms in accordance with Alarm Response Procedures (ARPs)</td></tr>
<tr><td></td><td>RO</td><td>Refer to ARP 1-AR-M6-D A-1:</td></tr>
<tr><td></td><td></td><td>Probable Causes:
1. Low pressure
a. Possible nitrogen vent valve or accumulator safety valve leaking.
b. Loss of accumulator inventory resulting in decreasing level.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE: The digital reading shall be used for the compliance instrument.</td></tr>
<tr><td></td><td></td><td>Corrective Actions</td></tr>
<tr><td></td><td></td><td>[1] CHECK CLA digital pressure indication on [1-PIS-63-128] and [1-PIS-63-126] (M-6).</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[2] IF CLA pressure is <624 psig OR >668 psig, THEN DECLARE the Accumulator inoperable.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[3] ADJUST accumulator level and/or pressure in accordance with 1-SO-63-1, <i>Cold Leg Injection Accumulators.</i></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[4] EVALUATE Technical Specifications, LCO 3.5.1.1 for applicability.</td></tr>
<tr><td></td><td></td><td>1. EVALUATE the following Tech Specs for applicability:
• 3.5.1.1.d Cold Leg Injection Accumulators: A nitrogen cover-pressure of between 624 and 668 psig
<u>ACTION a</u>: w/ 1 CLA inoperable, except from boron concentration not w/i limits, restore w/i 24 hrs or HT STBY w/i next 6 hrs & reduce Pzr pressure to ≤1000 psig w/i following 6 hrs.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 6 Event # 1 Page 2 of 46

Event Description: Cold Leg Accumulator Nitrogen Leak.

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or behavior</th></tr>
<tr><td colspan="3">1-SO-63-1, Cold Leg Injection Accumulators
Section 8.3 Adding Nitrogen to the Cold Leg Accumulators
Subsection8.3.1 Adding Nitrogen to Cold Leg Accumulator 1</td></tr>
<tr><td></td><td colspan="2">CAUTION 1: Do not cross connect the Cold Leg Accumulators.</td></tr>
<tr><td></td><td colspan="2">CAUTION 2: Each Cold Leg Accumulator shall be pressurized between 624 psig and 668 psig to comply with TS 3.5.1.1. The Accumulator safety relief valve is set to relieve pressure at 700 psig.</td></tr>
<tr><td></td><td></td><td>[1] ENSURE Power Checklist 1-63-1.01 complete.</td></tr>
<tr><td></td><td></td><td>[2] ENSURE Valve Checklist 1-63-1.02 complete.</td></tr>
<tr><td></td><td></td><td>[3] ENSURE Valve Checklist 1-63-1.06 complete.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[4] VERIFY the following valves CLOSED:</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>VALVE NUMBER</th><th>FUNCTION</th><th>INITIALS</th></tr>
<tr><td>1-FCV-63-107</td><td>No. 2 CL Accum N2 Supply Isol</td><td>________</td></tr>
<tr><td>1-FCV-63-87</td><td>No. 3 CL Accum N2 Supply Isol</td><td>________</td></tr>
<tr><td>1-FCV-63-63</td><td>No. 4 CL Accum N2 Supply Isol</td><td>________</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>[5] OPEN [1-FCV-63-64] N2 Supply to CL Accum.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE 1: Verifying regulator output pressure in the following two steps may be waived if necessary to save time when restoring pressure on an inoperable cold leg accumulator.</td></tr>
<tr><td></td><td colspan="2">NOTE 2: If nitrogen regulator outlet pressure is too low, Maintenance should be contacted for assistance.</td></tr>
<tr><td></td><td></td><td>[6] IF Unit 1 nitrogen regulator 0-PCV-77-254 is OPERABLE, THEN VERIFY pressure indicated on 0-PI-77-272 (downstream of 0-PCV-77-254) is greater than or equal to 650 psig.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 6 Event # 1 Page 3 of 46

Event Description: Cold Leg Accumulator Nitrogen Leak.

Time	Position	Applicant's Actions or behavior
		[7] **IF** Unit 1 nitrogen regulator 0-PCV-77-254 is INOPERABLE, **THEN ALIGN** Unit 2 nitrogen regulator 0-PCV-77-253 to supply U-1 cold leg accumulators as follows:
		[a] OPEN [0-77-865A]
		[b] **VERIFY** pressure indicated on 0-PI-77-269 (downstream of 0-PCV-77-253) is greater than or equal to 650 psig.
	NOTE:	If CLA pressure is less than 600 psig, then temperature monitoring is required to prevent brittle fracture of nitrogen piping downstream of 0-PCV-77-253 or -254.
		[8] **IF** Accumulator 1 pressure is less than 600 psig, **THEN PERFORM** the following during pressurization:
		[a] **MONITOR** piping temperature downstream of **[1-63-705]** using contact pyrometer.
		[b] **IF** piping temperature approaches 40°F, **THEN THROTTLE [1-63-705]** in close direction as necessary to maintain piping temperature greater than 40°F.
		[c] **WHEN** CLA #1 pressure is greater than 600 psig, **THEN STOP** temperature monitoring and **OPEN [1-63-705]** as desired.
		[9] **OPEN [1-FCV-63-127]** No. 1 CL Accum N2 Supply Isolation to admit nitrogen to accumulator.
	NOTE:	Tech Spec operability range for CLA pressure is 624-668 psig.
		[10] **WHEN** CLA #1 pressure increases to desired value, **THEN**
		a. **CLOSE [1-FCV-63-127]**.
		b. **CLOSE [1-FCV-63-64]**.
		c. **IF [1-63-705]** was THROTTLED, **THEN ENSURE [1-63-705]** is **FULLY OPEN**.
		d. **IF [0-77-865A]** was OPENED, **THEN ENSURE [0-77-865A]** is **CLOSED**.
		END OF TEXT SECTION 8.3.1

Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.

Op Test No.: NRC 2010302 Scenario # 6 Event # 1 Page 4 of 46

Event Description: Cold Leg Accumulator Nitrogen Leak.

Time	Position	Applicant's Actions or behavior
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 the CLA line up is returned to normal and Tech Specs are identified.

Op Test No.: NRC 2010302 Scenario # 6 Event # 2 Page 5 of 46

Event Description: First Stage Pressure Transmitter PT-1-73 Fails High.

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 2, PT-1-73 Fails High		
Alarms/Indications **Annunciator:** **1-M-5** • **1-XA-55-5A C-6, "TS-68-2P/Q REAC COOL LOOPS T REF T AUCT HIGH-LOW"** • **1-XA-55-5A B-7, "STEAM GEN LVL HIGH-LOW DEVIATION"** **Indications** **1-M-4** • **Automatic Control Rod motion** **1-M-5** • **1-TR-68-2B, RCS/TURBINE TEMP**		
T = 10	Crew	Respond to 1-M-5 alarms in accordance with Alarm Response Procedures (ARPs)
	RO	Identifies automatic control rod motion with no runback in progress, positions Rod Control Handswitch 1-HS-85-5110 to MANUAL
	BOP/RO	Refer to ARP 1-AR-M5-A C-6
	SRO	Direct entry to: AOP-C.01, Rod Control System Malfunctions, Sect 2.1, Uncontrolled Rod Bank Movement **OR** AOP-I.08, Turbine Impulse Pressure Instrument Malfunction
		AOP-C.01, Rod Control System Malfunctions **Sect 2.1, Uncontrolled Rod Bank Movement**
	NOTE: Step 1 is an immediate action step.	
	RO	1. **STOP** uncontrolled rod motion: a. **PLACE** rod control in MAN. b. **CHECK** rod motion STOPPED.
	CAUTION:	Control Rods should NOT be manually withdrawn during a plant transient.
	RO/BOP	2. **CHECK** for plant transient:
	RO	a. **CHECK** reactor power and T-avg STABLE.
	Crew	3. **CHECK** for instrumentation malfunction:
	RO	a. **CHECK** nuclear instrumentation OPERABLE.

Op Test No.: NRC 2010302 Scenario # 6 Event # 2 Page 6 of 46

Event Description: First Stage Pressure Transmitter PT-1-73 Fails High.

Time	Position	Applicant's Actions or Behavior
	RO	b. **CHECK** RCS RTDs OPERABLE
	BOP	c. **CHECK** turbine impulse pressure channels OPERABLE. ***(RNO required)***
	SRO	**RNO:** c. **GO TO** AOP-I.08, Turbine Impulse
		AOP-I.08, Turbine Impulse Pressure Instrument Malfunction **Section 2.1 Unit 1: Failure of Turbine Impulse Pressure Instrument 1-P-1-73**
	RO/SRO	1. **ENSURE** control rods in MANUAL.
	NOTE:	Loss of Instrument Power to S/G level setpoint program input will drive setpoint below 33%.
	BOP	2. **EVALUATE** placing main feedwater reg valves in MANUAL to maintain S/G levels on program Based on NOTE and secondary plant evaluation, FRVs remain in AUTO
		3. **ENSURE** steam dumps in steam pressure mode:
		a. **PLACE** steam dump FSV handswitches in OFF.
		b. **PLACE** steam dump mode selector in STEAM PRESS mode.
		c. **ENSURE** zero output (demand).
		d. **PLACE** steam dump FSV handswitches in ON.
		e. **ENSURE** steam dump controller setpoint at 1005 psig.
	SRO	4. **EVALUATE** the following Tech Spec for applicability • 3.3.1.1, Reactor Trip System Instrumentation **Functional Unit 22.E: Reactor Trip System Interlocks, Turbine Impulse Chamber Pressure, P-13 - ACTION 8.b: Reactor Trip- Turbine Trip**; w/ less than Minimum Number of Channels OPERABLE, declare the interlock inoperable and verify that all affected channels of the functions listed below are OPERABLE or apply the appropriate ACTION statement(s) for those functions.
	RO	5. **DETERMINE** Program T-avg for current reactor power **USING** TI-28 Figure 3 or ICS (NSSS / BOP, Program Reactor Average Temperature).

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Event Description: First Stage Pressure Transmitter PT-1-73 Fails High.

Time	Position	Applicant's Actions or Behavior
	RO	6. **RESTORE** T-avg to within 1°F of program value **USING** one of the following:
		• **POSITION** control rods **OR**
		• **ADJUST** turbine load **OR**
		• **ADJUST** RCS boron concentration.
	NOTE: If performing this AOP in conjunction with AOP-I.11 for Eagle LCP failure, **SRO determines NOTE is N/A**	
	Crew	7. **NOTIFY** I&C to perform Appendix A, Removing Unit 1 Turbine Impulse Pressure Loop 1-P-1-73 from Service.
	Crew	8. **INITIATE** Maintenance on 1-P-1-73.
	SRO	9. **GO TO** appropriate plant procedure.
		END OF SECTION
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Tech Specs are identified.		

Op Test No.:	NRC 2010302	Scenario #	6	Event #	3	Page	8 of 46

Event Description: Lp #4 SG Atmos. Relief Valve Fails Partially Open

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 3		

Indications/Alarms

Annunciator:

1-M-5

- **1-XA-55-5A, A-6, "TS-68-2M/N RC LOOPS T AVG/AUCT T AVG DEVN HIGH-LOW"**
- **C-6, "TS-68-2P/Q REAC COOL LOOPS T REF T AUCT HIGH-LOW"**

1-M-6

- **1-XA-55-6B, D-7, "FS-3-103B STM GEN LOOP 4 STEAM/FEEDWATER FLOW MISMATCH"**

Indications

1-M-4

- **1-FI-3-103A, 103B SG-4 FW INLET FLOW CH-1, CH-2** indicating increasing flow (compared to SGs 1-3)
- **1-FI-1-28A, 28B SG-4 STEAM FLOW CH-1, CH-2** indicating increasing flow (compared to SGs 1-3)

1-M-5

- **1-TR-68-2B RCS/TURBINE TEMP recorder** shows RCS temperature deviating from reference temperature

Significant Resultant Alarms/Indications:

- **Automatic Control Rod motion** in response to Secondary-to-Primary temperature mismatch

T + 30	Crew	Respond to 1-M-5 & 6 alarms in accordance with Alarm Response Procedures (ARPs)
	BOP/RO	Identifies ARP 1-AR-M5-A A-6, C-6 acknowledges alarm and, notifies SRO
	SRO	Acknowledges and enters AOP-S.05, Steam Or Feedwater Leak
		AOP-S.05, Steam Or Feedwater Leak
	Crew	1. **MONITOR** personnel safety:
		a. **IF** steam or feedwater lines need to be immediately isolated to protect personnel, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **IF** leak is on steam lines **OR** source is unknown, **THEN CLOSE** MSIVs.
		3) **IF** leak is on feedwater lines **OR** source is unknown, **THEN PERFORM** the following:
		a) **TRIP** MFW pumps.
		b) **CLOSE** Feed Reg Valves.
		4) **GO TO** E-0, Reactor Trip or Safety Injection.

Op Test No.:	NRC 2010302	Scenario #	6	Event #	3	Page	9	of	46
Event Description:	Lp #4 SG Atmos. Relief Valve Fails Partially Open								

Time	Position	Applicant's Actions or Behavior
	RO	2. **MONITOR** steam generator levels STABLE on program.
Evaluator Note:		BOP action to place 1-HS-1-31, SG-4 ATM RELIEF VALVE CONTROL to CLOSE and will close the #4 SG Atmospheric Relief Valve
	BOP	3. **CHECK** the following:
		• S/G atmospheric relief valves CLOSED ***(RNO required)***
		• steam dumps CLOSED.
	BOP	**RNO:** **IF** any S/G atmospheric relief valve or steam dump is leaking or failed open, **THEN CLOSE** valve(s) **USING** MCR switch.
		IF any valve CANNOT be closed**... N/A**
		4. **CHECK** main turbine on line.
		5. **MONITOR** the following:
		• reactor power STABLE • reactor power less than or equal to 100% (3455 MWt). ***(RNO if required)***
		RNO: **REDUCE** turbine load as necessary to maintain reactor power less than or equal to 100% (3455 MWt).
	RO	6. **MONITOR** T-avg within 3°F of T-ref. ***(RNO if required)***
	SRO/ BOP	**RNO:** **REDUCE** turbine load as necessary to maintain T-avg within 3°F of T-ref (or program value).
	SRO	**IF** T-avg CANNOT be maintained within 5°F of T-ref (or program value), **THEN PERFORM** the following:
	RO	a. **TRIP** the reactor
	BOP	b. **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.

Op Test No.:	NRC 2010302	Scenario #	6	Event #	3	Page	10 of 46
Event Description:	Lp #4 SG Atmos. Relief Valve Fails Partially Open						

Time	Position	Applicant's Actions or Behavior
	Crew	c. **GO TO** E-0, Reactor Trip or Safety Injection.
Evaluator Note: **remaining Steps 7-14 should be 'check/verify' actions based on expected previous crew actions.**		
	NOTE: Tech Spec LCO 3.6.1.4 is applicable if containment pressure exceeds 0.3 psig.	
	RO	7. **MONITOR** containment pressure STABLE
	Crew	Steps 8-14
		15. **EVALUATE** actions required to restore plant to normal.
		16. **Go** to appropriate plant procedure.
		END OF SECTION
Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.		
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Atmospheric Relief Valve is closed and RCS temperature is stable.		

Op Test No.: NRC 2010302 Scenario # 6 Event # 4 Page 11 of 46

Event Description: 1A Main Feedwater Pump High Vibration - Manual Trip required

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 4		
Indications/Alarms **Annunciator:** **1-M-5** • **1-XA-55-3B, B-5, "THRUST PRETRIP OR VIBRATION EXCESSIVE"** **Indications:** • **ICS Terminal: Secondary Mimics→MAINFEED PUMPS→Click on MFP 'A' Icon (MFP "A" RUN OUT Action Field for baseline vibration data)** **Significant Resultant Alarms/Indications:** • **1-XA-55-3B, A-1, "MAIN FEEDWATER PUMP TURBINE 1A ABNORMAL"**		
T = 30	Crew	Respond to 1-M-3 alarms in accordance with Alarm Response Procedures (ARPs)
	BOP/RO	Identifies ARP 1-AR-M3B B-5, acknowledges alarm and, notifies SRO
	SRO	Acknowledges and implements ARP actions
		ARP 1-AR-M3B B-5
		Probable Causes:
		<u>Thrust Bearing Wear:</u>
		1. Turbine or pump seal malfunction. 2. Turbine mechanical failure. 3. Thrust bearing mechanical failure. 4. Loss of power to Bently Nevada Panel.
		<u>Excessive Vibration:</u>
		1. Rotor Imbalance 2. Low Oil Temperature 3. Bearing Failure 4. Loose Parts/Turbine Blading 5. Turbine vibration carry through. 6. Excessive Moisture in Steam
	NOTE 1: ICS can be used to determine baseline vibration data. The baseline corresponds to the Electrical Runout value given on ICS.	
	NOTE 2: Local Bently-Nevada panel should be used to determine thrust bearing or vibration values.	

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Event Description: 1A Main Feedwater Pump High Vibration - Manual Trip required

Time	Position	Applicant's Actions or Behavior
	NOTE 3: Bently Nevada thrust bearing monitor will trip the MFPT on high thrust bearing wear setpoint of 10 mils above baseline (forward movement only) with 2/2 logic. (Alert value is 7 mils above baseline.)	
	NOTE 4: MFW pump and turbine bearing vibration on Bently-Nevada panel should not exceed 5 mils above baseline (Alert value is 3 mils above baseline.)	
		ARP Corrective Actions:
Evaluator Note: Once the crew has demonstrated the ability to determine MFP vibration severity, field reports will present an oil leak plus the vibration situation requiring a manual 1A MFP trip and entry into AOP-S.01. Applicable section of AOP-S.01, Loss of Normal Feedwater follows this event guide.		
		[1] **IF** MFP trips, **THEN GO TO** AOP-S.01, *Loss of Normal Feedwater*
		[2] **OBSERVE** windows (A-1) or (B-1) to determine which MFPT is affected
		[3] **CHECK** ICS, Secondary Mimics, MFP Bearing Data to determine the affected MFWP.
		[4] **IF** Excessive Thrust Bearing wear is indicated, **... N/A**
		[5] **IF** Excessive Turbine Vibration is indicated, **THEN**
		[a] **DISPATCH** operators to affected MFPT to perform the following:
		• CHECK local vibration indication on Bently-Nevada panel (Refer to GOI-6, *Apparatus Operations*). • CHECK for abnormal noises or other indications of problem.
		[b] :**MONITOR** turbine vibration on ICS, Secondary Mimics, MFP Bearing Data.

Op Test No.: NRC 2010302 Scenario # 6 Event # 4 Page 13 of 46

Event Description: 1A Main Feedwater Pump High Vibration - Manual Trip required

Time	Position	Applicant's Actions or Behavior
		[c] IF local vibration indication at or above Alert value, **THEN CONTACT** Predictive Maintenance and Engineering for assistance.
		[d] IF vibration problem valid **AND** vibration exceeding 5 mils above baseline, **THEN REMOVE** MFWP from service using one of the following:
		• 0-GO-5, *Normal Power Operation* **OR** • AOP-C.03, *Rapid Shutdown or Load Reduction.*
		If the crew elects to trip 1A MFP, the SRO should enter AOP-S.01, Main Feedwater Malfunctions Section 2.7, Main Feedwater Pump Trip Below 76% Turbine Load.
		Following AOP-S.01 performance, the crew will conduct a brief.

Evaluator Note: The following CREW Brief and Notification actions are not contained in the procedure.

		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		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 Tech Specs are identified and the crew determines plant power reduction is required.

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Event Description: 1A Main Feedwater Pump High Vibration - Manual Trip required

Time	Position	Applicant's Actions or Behavior
		AOP-S.01, Main Feedwater Malfunctions Section 2.7, Main Feedwater Pump Trip Below 76% Turbine Load
	Crew	SRO directs AOP-S.01 Section 2.7 implementation.
		[1] **MONITOR** at least one MFW pump RUNNING.
		[2] **ENSURE** running MFW pump loads as required.
		[3] **CHECK** feedwater flow greater than steam flow. ***(RNO required)***
		RNO: **IF** steam flow reduction is needed, **THEN PERFORM** the following:
		a. **REDUCE** turbine load **USING** valve position limiter.
		b. **ENSURE** control rods inserted as necessary to match T-avg and T-ref.
		[4] **MONITOR** steam generator levels returning to program level. ***(RNO required)***
		RNO: **PERFORM** the following:
		a. **IF** any MFW Reg valve is in AUTO **AND** controller deviation is off-scale high with level above program, **THEN PLACE** affected MFW Reg valve controller(s) to MANUAL and back to AUTO to reset output.
		b. **IF** manual control of MFWP speed or feed reg valve position is needed, **THEN PERFORM** the following as necessary:
		• **ADJUST** running MFWP speed OR • **ADJUST** MFW Reg valve position.

Op Test No.:	NRC 2010302	Scenario #	6	Event #	4	Page	15 of 46
Event Description:	1A Main Feedwater Pump High Vibration - Manual Trip required						

Time	Position	Applicant's Actions or Behavior
		AOP-S.01, Main Feedwater Malfunctions **Section 2.7, Main Feedwater Pump Trip Below 76% Turbine Load**
		c. **IF** reactor trip is imminent due to low S/G level, **THEN TRIP** the reactor and **GO TO** E-0, Reactor Trip or Safety Injection.
		d. **WHEN** S/G levels are stable and on program, **THEN EVALUATE** placing MFWP speed controls and MFW Reg valve controllers in AUTO.
		[5] **CHECK** reactor power less than 60%. ***(RNO required)***
		RNO: **ENSURE** affected Main Feedwater Pump Turbine Condenser isolation valves CLOSED:
		a. MFWP A
		• FCV-2-205, Condensate Inlet • FCV-2-210, Condensate Outlet
		OR
		b. MFWP B
		• FCV-2-211, Condensate Inlet • FCV-2-216, Condensate Outlet
		[6] **ENSURE** unit is returning to stable conditions
		[7] **DISPATCH** personnel to investigate MFW pump trip.
		[8] **CHECK** C-7 LOSS OF LOAD permissive DARK. [M4A, window E-5]
		[9] **CHECK** valve position limit light DARK. [M-2] ***(RNO required)***

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Event Description: 1A Main Feedwater Pump High Vibration - Manual Trip required

Time	Position	Applicant's Actions or Behavior
AOP-S.01, Main Feedwater Malfunctions **Section 2.7, Main Feedwater Pump Trip Below 76% Turbine Load**		
		RNO: **RESTORE** turbine controls as necessary **USING** Appendix B.
Evaluator Note: Appendix B, Turbine Runback Restoration follows this event guide.		
	NOTE: To ensure unit is within capacity of one MFWP, the following should be considered when determining final power level: • Power should be reduced below 60% (if all cond booster pumps and heater drain tank pumps in service) or 55% (if two cond booster pumps in service). • Less than or equal to 90% controller output should be maintained on running MFWP	
		[10] **INITIATE** load reduction as required **USING** 0-GO-5.
Evaluator Note: Power reduction is controlled by rod motion and turbine load change. Once the desired plant load reduction (in this case 10-15%) is complete, the crew would assess reactor core distribution limits to determine boration control/changes. 0-SO-62-7, Boron Concentration Control is used to determine and control boron concentration changes required to manage these limits (specifically GO-5 Precautions 3.1 'O' and 'P'). Portions of Go-5 and		
	CAUTION: Reactor operation at low power levels for extended periods may challenge reactivity control due to xenon changes.	
		[11] **CHECK** Reactor power greater than 5%.
		[12] **INITIATE** repairs on affected equipment
		[13] **GO TO** appropriate plant procedure
		END OF SECTION
Evaluator Note: SRO/CREW should insure reactor power is stable per AOP-S.01 and may conduct a brief at this time.		
Lead Examiner may cue next event when the CREW has stabilized plant power.		

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Event Description:	1A Main Feedwater Pump High Vibration - Manual Trip required						

SQN	**MAIN FEEDWATER MALFUNCTIONS**	**AOP-S.01** **Rev. 16**

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APPENDIX B

TURBINE RUNBACK RESTORATION

NOTE This appendix is used to remove turbine from valve position limiter prior to starting load reduction following a BOP runback.

[1] **ENSURE** governor valve tracking meter centered close to **ZERO**. ☐

[2] **DEPRESS** [TURB MANUAL] mode selector pushbutton. ☐

[3] **VERIFY** [TURB MANUAL] lamp LIT. ☐

[4] **VERIFY** reference and setter counters stabilize. ☐

[5] **ENSURE** governor valve tracking meter centered close to **ZERO**. ☐

[6] **DEPRESS** [OPER AUTO] mode selector pushbutton. ☐

[7] **VERIFY** [OPER AUTO] lamp LIT. ☐

[8] **VERIFY** reference and setter counters stabilize. ☐

[9] **IF** VALVE POS LIMIT light is LIT,
THEN
REDUCE turbine load reference using SETTER
UNTIL VALVE POS LIMIT light is DARK. ☐

END

Op Test No.: NRC 2010302 Scenario # 6 Event # 5 Page 18 of 46

Event Description: Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
Simulator Operator: No actions for Event 5, Plant Power Reduction		
Alarms/Indications available: none		
Evaluator Note:		**Due to current conditions and if the crew chooses to perform a 0-GO-5 power reduction, the first step actually performed is in Section 5.3 Step 14 through Step 15.3, below.** **Operator information on how to conduct the load reduction are contained in NOTES prior to Section 5.3 Steps 1 and 7; they follow:**
T = 40		
	0-GO-5 Section 5.3 Step 1 NOTES: **NOTES** 1) This section may be used to reduce power to ~30% during plant shutdown OR a portion of this section may be performed to reduce power as required by plant conditions. Steps which are not required for partial load reduction may be marked N/A with SM concurrence as specified by SPP-2.2. 2) Appendix D provides guidance on recommended power values to maintain condensate pressure if secondary plant equipment must be removed from service for maintenance. 3) Steps 5.3[2] through 5.3[6] may be performed out of sequence.	
	0-GO-5 Section 5.3 Step 7 NOTES: **NOTES** 1) Guidance on restoration of EHC Controls after a BOP runback is contained in Appendix B, *Turbine Runback Restoration*. [C.4] 2) For core operating recommendations for situations such as end of core life coast down or unusual power maneuvers, contact Reactor Engineering for guidance. [C.5] 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 T_{AVG} within limits of T_{REF}, (b) reduce turbine load to match T_{REF} with T_{AVG} (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.	

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Event Description: Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
Evaluator Note:	**According to AOP S.01 Section 2.7 Step 10 NOTE:**	
	NOTE: To ensure unit is within capacity of one MFWP, the following should be considered when determining final power level: • Power should be reduced below 60% (if all cond booster pumps and heater drain tank pumps in service) or 55% (if two cond booster pumps in service). • Less than or equal to 90% controller output should be maintained on running MFWP	
	CREW	Load reduction as required USING 0-GO-5, NORMAL POWER OPERATION, Section 5.3 Power Reduction From 100% to 30%
	NOTE Turbine Impulse pressure relay lights are located on L-262.Relay lights are dark when relays are **NOT** armed. Relay No. 4 is a spare.	
		[14] **WHEN** turbine load less than 71% (Unit 1) 72% (Unit 2), **THEN PERFORM** one of the following (N/A substep not performed):
		[14.1] **VERIFY** Turbine Runback circuits are NOT armed by performing the following:
		A. **ENSURE [PIS-47-13RLY1]**, (Turbine runback from MFP loss) is NOT LIT.
		B. **ENSURE [PIS-47-13RLY2]**, (Turbine runback from No. 3 HDT) is NOT LIT.
		C. **ENSURE [PIS-47-13RLY3]**, (Closure of LCV-6-106B from Loss of any #3 HDTP) is NOT LIT.
		[14.2] **VERIFY** Turbine Runback circuits are NOT armed by performing the following:
		A. **ENSURE [FU2-47-13A]**, (Turbine runback from MFP loss) **REMOVED** (Aux Inst Rm. R71).
		B. **ENSURE [FU2-500-R071K3]**, (Turbine runback from No. 3 HDT) **REMOVED** (Aux Inst Rm R-75).
		C. **ENSURE** jumper between P18-1 and P18-2 in Pnl 262, (Closure of LCV-6-106B from Loss of any #3 HDTP) **REMOVED**.

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Event Description: Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
		CAUTION **Valves LCV-6-106A and 106B shall be verified to be controlling properly during unit load reduction.**
		NOTES 1) If holding at a power level less than 60% the condensate demineralizer booster pumps may be left running. 2) Shutdown of the condensate demineralizer booster pumps and #3 heater drain pumps should be based upon header pressure and ability of the drain tank pumps to pump forward. 3) This step may be deferred if performing load reduction for AOP-S.01 or AOP-S.04. 4) Steps 5.3[15] through 5.3[20] may be performed out of sequence
		[15] **WHEN** between 55 to 70% turbine load, **THEN PERFORM** the following:
		[15.1] **SIMULTANEOUSLY STOP** both operating condensate demineralizer booster pumps in accordance with 1,2-SO-2/3-1 (N/A if NOT in service).
		[15.2] **VERIFY** #3 HDT runback NOT armed by ensuring either (N/A method NOT used) Step 5.3[14.1]B completed **OR** Step 5.3[14.2]B completed.
		[15.3] **STOP** one of the three #3 heater drain tank pumps in accordance with 1,2-SO-5-2.
Evaluator Note:		**Due to current conditions and if the crew chooses to perform a 0-GO-5 power reduction, the first step performed is Section 5.3 Step 14. The power reduction would end point be here, Step 15.3. Taking the HDT Pump out would be an SRO decision based on secondary plant flows and pressures.**
Evaluator Note:		The following CREW Brief and Notification actions are not contained in the procedure.
		CREW Brief would typically be conducted for this event as time allows prior to the next event.

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Event Description:	Plant Power Reduction						

Time	Position	Applicant's Actions or Behavior
		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 plant power is less than 60%.

Op Test No.:	NRC 2010302	Scenario #	6	Event #	5	Page	22 of 46
Event Description:	Plant Power Reduction						

Time	Position	Applicant's Actions or Behavior
		0-SO-62-7, Boron Concentration Control **Section 6.4, Borate**
Evaluator Note:		Power reduction to the desired plant load reduction as directed by AOP-S.01 Section 2.7 (in this case 10-15%) is complete. GO-5 Precautions 3.1 'O' and 'P' direct controlling reactor core distribution limits and control rod height. 0-SO-62-7, Boron Concentration Control is used to determine and control boron concentration changes required to manage these limits.
	Crew	SRO directs 0-SO-62-7 Section 6.4 implementation.
	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. [C.2]
	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. If Normal Spray is NOT available, then this should be accomplished by use of Auxiliary Spray (1, 2-SO-62-1) in conjunction with pressurizer backup heaters.
	RO	[1] **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	[2] **RECORD** the quantity of boric acid required to achieve desired boron concentration using Appendix D. ___________ gals
	RO	[3] **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)

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Event Description: Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
0-SO-62-7, Boron Concentration Control **Section 6.4, Borate**		
	RO	[4] **DETERMINE** available boric acid volume in in-service BAT. ___________ gals
	RO	[5] **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 [6] **BORATE** position.
	RO	[7] **ADJUST [FC-62-139]**, Boric Acid Flow Controller to the desired flow rate.
	RO	[8] **SET [FQ-62-139]**, Batch Integrator to the desired quantity.
	RO	[9] **PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **START** position.
	RO	[10] **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	[11] **VERIFY** Boric Acid Flow established.

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Event Description: Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
0-SO-62-7, Boron Concentration Control **Section 6.4, Borate**		
	NOTE: It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.	
	RO	[12] **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	[13] **MONITOR** Boric Acid Storage Tank level.
	RO	[14] **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.
	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.	
		[15] **WHEN** boration is complete, **THEN**
	RO	[a] **PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **STOP** position. [b] **CHECK** no primary water flow on either **[FI-62-142A] OR [FQ-62-142]**. [c] **ENSURE [FC-62-142]**, Primary Water to Blender Flow Controller is in **AUTO** position and the potentiometer (dial indicator) is set at 35%. [d] **ADJUST [FC-62-139]**, Boric Acid Flow Controller to the desired blend solution in accordance with TI-44 Boron Tables. [e] **ENSURE [FCV-62-128]** is **CLOSED**. [f] **PLACE [HS-62-140B]**, CVCS Makeup Selector Switch to the **AUTO** position. [g] **PLACE [HS-62-140A]**, Boric Acid to Blender Flow Control Switch to the **START** position. [h] **IF** RCS boron sample required, **THEN NOTIFY** Chem Lab to obtain RCS boron sample.

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Event Description: Plant Power Reduction

Time	Position	Applicant's Actions or Behavior
		0-SO-62-7, Boron Concentration Control **Section 6.4, Borate**
	NOTE:	Boration is done in batches until the total boron and/or power change is completed.
	RO	[16] **REPEAT** this section as required to complete total boron change.
	RO	[17] **WHEN** total boration is complete, [i] **THEN: REALIGN** the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1. [j] **NOTIFY** Chem Lab to obtain RCS boron sample.
	SRO	[18] **IF** in **MODES** 1, 2, or 3, **THEN ENSURE** requirements of TRM 3.1.2.6 are met.
		[19] If in MODES 4, 5 or 6 THEN ensure requirements of TRM 3.1.2.5 are met
		[20] **GO TO** appropriate plant procedure
		END OF SECTION

SQN 1,2	BORON CONCENTRATION CONTROL	0-SO-62-7 Rev. 58 Page 163 of 201

APPENDIX D

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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.

____
Initials

END OF TEXT

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Event Description: Plant Power Reduction

SQN **1,2**	**BORON CONCENTRATION CONTROL**	0-SO-62-7 Rev. 58 Page 190 of 201

APPENDIX I

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

NOTE One calculation is required for each major change.

[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. ☐

END OF TEXT

Op Test No.: NRC 2010302 Scenario # 6 Event # 6, 7 Page 28 of 46

Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior

Simulator Operator: When directed, initiate Events 6 & 7

Indications available:

Annunicators:

1-M-3

- **1-XA-55-3A E-1, "PS-2-129 LOW NPSH AT MFP'S"**
- **1-XA-55-3C C-6, "LS-3-171D STM GEN #4 LEVEL LOW"**
- **E-6, "LS-3-175D STM GEN #4 LEVEL LOW"**

1-M-5

- **1-XA-55-5A A-7, "FS-3-35A STEAM GEN FEEDWATER FLOW HIGH"**
- **B-7, "LS-3-42D STEAM GEN LVL HIGH-LOW DEVIATION"**

1-M-6

- **1-XA-55-6B D-1, "LS-3-107D STM GEN LOOP 4 LOW FW FLOW LOW WATER LEVEL"**
- **D-4, "LS-3-106B STEAMGENERATOR LOOP 4 LOW LOW WATER LEVEL"**
- **D-7, "FS-3-103B STM GEN LOOP 4 STEAM/FEEDWATER FLOW MISMATCH"**

Indicators:

1-M-4

- **1-FI-1-103A, 103B, SG-4 FW INLET FLOW CH-1 & 2: varying feedwater flow**
- **1-LI-3-110, 107, 106, SG-4NR LEVEL: decreasing level**

Significant Resultant Alarms/Indications:

Annunciators:

- **1-XA-55-2C, C-7, D-7, E-7: "LS-2-3A, 2-9A, 2-12A CONDENSER HOTWELL LEVEL ABNORMAL"**

Deviations or unexpected conditions:

- **Increase in feedwater flow.**
- **Deviations on feedwater regulating valves.**
- **Main feedwater pump speed increasing.**
- **Steam generator level dropping**

T = 70	CREW	Refer to alarm response procedures and carries out the following actions:

Evaluator Note: Personnel safety is a concern since this feedwater break is outside containment; the crew should take appropriate action based on AUO reports that the TB el 685' is inaccessible with excessive steam and loud noise report; the leak location is on main feedwater common pipe downstream of No. 1 Feedwater Heater.

	SRO	Directs crew to enter AOP-S.05, Steam Or Feedwater Leak.
		AOP-S.05, Steam Or Feedwater Leak

Evaluator Note: Since the following step is a **"MONITOR"** step, the crew may continue in the procedure while developing a reactor vs. turbine power trend (**RNO** second bullet). If so, steps 6 or 8 could be the decision point to initiate a reactor trip and transition to E-0. If an excessive delta between reactor and secondary power develops or hotwell level is challenged (i.e.: secondary make-up capability), the crew may decide to trip the reactor and transition to E-0.

Op Test No.: NRC 2010302 Scenario # 6 Event # 6, 7 Page 29 of 46

Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
Evaluator Note:		Since this is a **"MONITOR"** step, the crew may continue in the procedure while determining Steam vs. feed line break. SG programmed level deviation following a normal load change is not unusual. The crew may continue in the procedure while monitoring SG levels in steps 1 & 2. Step 6 insures that RCS temperature is controlled within these normal ranges; if the crew cannot control these limits, they should decide to trip the reactor and transition to E-0.
	Crew	1. **MONITOR** personnel safety:
		a. **IF** steam or feedwater lines need to be immediately isolated to protect personnel, **THEN PERFORM** the following:
	RO	1) **TRIP the reactor.**
	BOP	2) **IF** leak is on steam lines **OR** source is unknown, **THEN CLOSE** MSIVs.
	BOP	3) **IF leak is on feedwater lines OR source is unknown, THEN PERFORM the following:**
	BOP	a) **TRIP MFW pumps.**
	BOP	b) **CLOSE Feed Reg Valves.**
	SRO	4) **GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	2. **MONITOR** steam generator levels STABLE on program.
	BOP	3. **CHECK** the following:
		- S/G atmospheric relief valves CLOSED
		- steam dumps CLOSED.
	BOP	4. **CHECK** main turbine on line.
Evaluator Note:		Since this is a **"MONITOR"** step, the crew may continue in the procedure while developing a reactor vs. turbine power trend (**RNO** second bullet). If so, steps 6 or 8 may be the decision point and therefore transition to reactor trip and E-0 implementation. If an excessive delta between reactor and secondary power develops, the crew may decide to trip the reactor and transition to E-0 here.
		5. **MONITOR** the following:
	RO	- reactor power STABLE ***(RNO required)***

Op Test No.:	NRC 2010302	Scenario #	6	Event #	6, 7	Page	30 of 46
Event Description:	Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip						

Time	Position	Applicant's Actions or Behavior
		• reactor power less than or equal to 100% (3455 MWt).
		RNO: **REDUCE** turbine load as necessary…**N/A**
	SRO	**IF** any of the following conditions exist:
		• greater than 35 MWe load drop is required to maintain reactor power less than or equal to 100% **OR**
		• steam leak results in reactor power rising by 3% or more **OR**
		• reactor power CANNOT be controlled by turbine load reduction
	SRO	**THEN PERFORM** the following:
	RO	a. **TRIP** the reactor.
	BOP	b. **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.
	SRO	c. **GO TO** E-0, Reactor Trip or Safety Injection.
Evaluator Note:	Since this is a **"MONITOR"** step, the crew may continue in the procedure while developing a T-ave vs. T-ref trend. The 3° delta between actual RCS temperature, T-ave, and programmed reference temperature, T-ref is the range the system is capable of restoring following a normal load change. 5° delta is based on the maximum load transient for the RCS. Step 6 insures that RCS temperature is controlled within these normal ranges; if the crew cannot control these limits, they should decide to trip the reactor and transition to E-0.	
	RO	6. **MONITOR** T-avg within 3°F of T-ref. ***(RNO required)***
	BOP	**RNO:** **REDUCE** turbine load as necessary to maintain T-avg within 3°F of T-ref (or program value).
	SRO	**IF** T-avg CANNOT be maintained within 5°F of T-ref (or program value), **THEN PERFORM** the following:
	RO	a. **TRIP** the reactor
	BOP	b. **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.

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Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
	SRO	c. **GO TO** E-0, Reactor Trip or Safety Injection.
	SRO	IF a reactor trip is directed, THEN GO TO E-0, *Reactor Trip or Safety Injection.*
	SRO	Direct Manual Rx Trip
	SRO	Enter E-0 and Direct Immediate Operator Actions (IOAs)
	NOTE: Tech Spec LCO 3.6.1.4 is applicable if containment pressure exceeds 0.3 psig.	
	RO	7. **MONITOR** containment pressure STABLE
	BOP	8. **MONITOR** hotwell level STABLE:
		• **VERIFY** LCV-2-9 maintaining hotwell level in AUTO.
	BOP	**RNO:** **INITIATE** makeup to hotwell:
		RNO a & b … N/A: hotwell make-up is not affected by scenario malfunctions
		c. **IF** loss of hotwell level is imminent, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.
		3) **GO TO** E-0, Reactor Trip or Safety Injection.
	SRO	IF a reactor trip is directed, THEN GO TO E-0, *Reactor Trip or Safety Injection.*
	SRO	Direct Manual Rx Trip
	SRO	Enter and Direct E-0 Immediate Operator Actions (IOAs)

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Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		E-0, *Reactor Trip or Safety Injection*
Evaluator Note:		Following IOA performance, prior to Steps 1-4 immediate action verification, RO/BOP surveys MCBs for any expected automatic system response that failed to occur. Upon discovery, they may take manual action(s) to align plant systems as expected for the event in progress. (Ref. EPM-4, Prudent Operator Actions) Following the reactor trip, RCS Tave will drop below 550°F, which makes up the Feedwater Isolation logic. Annunciator 1-XA-55-6B E-6, LOW TAVG REACTOR TRIP MAIN FEEDWATER VALVES ACTUATED (Tave <550°F and P-4, Reactor Trip Breaker open signal) indicates FWI conditions are present. E-0 below scripts operator actions with no SI and transition to ES-0.1. If the operators actuate SI, that script follows this.
Annunicators/Indications as specified at Event 6 initiation		
	Note 1	Steps 1 through 4 are immediate action steps
	Note 2	This procedure has a foldout page
	RO	1. VERIFY reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
	BOP	2. VERIFY turbine TRIPPED: • Turbine stop valves CLOSED.
	BOP	3. VERIFY at least one train of shutdown boards ENERGIZED. • Attempt to restore power to at least ONE train of shutdown boards • Place DG 1A-A control switch in START • Verify Train A Shutdown Boards ENERGIZED
	RO	4. DETERMINE if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated) ***(RNO Required)***
	RO/BOP	**RNO:** DETERMINE if SI required: a. IF any of the following conditions exists: • S/G pressure less than 600 psig,

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Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
E-0, *Reactor Trip or Safety Injection*		
		OR • RCS pressure less than 1870 psig, OR • Containment pressure greater than 1.5 psig, THEN ACTUATE SI – **SI NOT ACTUATED: E-0 Step 4 RNO b. below**
Evaluator Note: SRO/crew should evaluate/exercise **FOLDOUT PAGE <u>EVENT DIAGNOSTICS</u>** for SG level loss during performance of the prudent operator actions (POAs)		
Evaluator Note: If the crew manually closes the Feedwater Isolation Valves, 1-FCV-3-33, 47, 87 and 100 from 1-M-4 handswitches and **ENSURES**/closes Feed Reg Valves/Bypass valves from 1-M-3 controllers, this meets the **Critical Task.** **Critical Task:** Manually isolate/verify feedwater isolation prior to SG(s) inventory loss at this time. **START TIME:** __________ **END TIME:** __________		
FOLDOUT PAGE		
		<u>RCP TRIP CRITERIA</u> – N/A
		<u>EVENT DIAGNOSTICS</u>
		• **IF** any S/G pressure is dropping uncontrolled, **THEN PERFORM** the following:
	RO/BOP	a. **CLOSE** MSIVs and MSIV bypass valves
		b. **IF** any S/G pressure continues to drop uncontrolled, **THEN PERFORM** the following:
	RO	**1) ENSURE** SI actuated.
		2) IF at least one S/G is intact (S/G pressure controlled or rising), **THEN....subsequent Actions N/A**
	SRO	**E-0 Step 4 RNO b:** b. **IF** SI is NOT required, **THEN PERFORM** the following:
		1) **MONITOR** status trees.
		2) **GO TO** ES-0.1, Reactor Trip Response.
Evaluator Note: Crew should recognize Loss of Heat Sink entry conditions, implement 1-FR-0 verification and transition to FR-H.1 at ES-0.1, Reactor Trip Response Step 1. Therefore, no ES-0.1 in this scenario guide.		

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Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		E-0, *Reactor Trip or Safety Injection*
Evaluator Note:		Following IOA performance, prior to Steps 1-4 immediate action verification, RO/BOP surveys MCBs for any expected automatic system response that failed to occur. Upon discovery, they may take manual action(s) to align plant systems as expected for the event in progress. (Ref. EPM-4, Prudent Operator Actions) Following the reactor trip, RCS Tave will drop below 550°F, which makes up the Feedwater Isolation logic. Annunciator 1-XA-55-6B E-6, LOW TAVG REACTOR TRIP MAIN FEEDWATER VALVES ACTUATED (Tave <550°F and P-4, Reactor Trip Breaker open signal) indicates FWI conditions are present.
Annunicators/Indications as specified at Event 6 initiation		
	Note 1 Steps 1 through 4 are immediate action steps	
	Note 2 This procedure has a foldout page	
	RO	5. VERIFY reactor TRIPPED: • Reactor trip breakers OPEN • Reactor trip bypass breakers DISCONNECTED or OPEN • Neutron flux DROPPING • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps.
	BOP	6. VERIFY turbine TRIPPED: • Turbine stop valves CLOSED.
	BOP	7. VERIFY at least one train of shutdown boards ENERGIZED. • Attempt to restore power to at least ONE train of shutdown boards • Place DG 1A-A control switch in START • Verify Train A Shutdown Boards ENERGIZED
	RO	8. DETERMINE if SI actuated: • ECCS pumps RUNNING. • Any SI alarm LIT [M-4D] (SI will be actuated) ***(RNO Required)***
	RO/BOP	**RNO:** DETERMINE if SI required: b. IF any of the following conditions exists: • S/G pressure less than 600 psig, OR

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Event Description:	Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip								

Time	Position	Applicant's Actions or Behavior
		E-0, *Reactor Trip or Safety Injection*
		• RCS pressure less than 1870 psig, OR • Containment pressure greater than 1.5 psig, THEN ACTUATE SI.
Evaluator Note:		SRO/crew should exercise **FOLDOUT PAGE** **<u>EVENT DIAGNOSTICS</u>** for SG depressurization during performance of the prudent operator actions (POAs)
Evaluator Note:		If the crew manually closes the Feedwater Isolation Valves,1-FCV-3-33, 47, 87 and 100 from 1-M-4 handswitches and **ENSURES**/closes Feed Reg Valves/Bypass valves from 1-M-3 controllers, then this meets the **Critical Task.**
Critical Task:		Manually isolate/verify feedwater isolation prior to SG(s) inventory loss at this time.
		FOLDOUT PAGE
		<u>RCP TRIP CRITERIA</u> – N/A
		<u>EVENT DIAGNOSTICS</u>
		• **IF** any S/G pressure is dropping uncontrolled, **THEN PERFORM** the following:
	RO/BOP	c. **CLOSE** MSIVs and MSIV bypass valves
		d. **IF** any S/G pressure continues to drop uncontrolled, **THEN PERFORM** the following:
	RO	3) **ENSURE** SI actuated.
		4) **IF** at least one S/G is intact (S/G pressure controlled or rising), **THEN….subsequent Actions N/A**
Evaluator Note:		Actions for ES-0.5 are contained in attachment at back of scenario guide
	BOP	9. PERFORM ES-0.5, Equipment Verifications WHILE continuing in this procedure.
	RO	10. 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 all S/Gs. ***(RNO required)***

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Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		E-0, *Reactor Trip or Safety Injection*
	RO	**RNO:** a. **IF** S/G narrow range level is less than 10% [25% ADV] in all S/Gs, **THEN START** AFW pumps and **ALIGN** valves as necessary to raise AFW flow greater than 440 gpm.
	RO	b. **MAINTAIN** total feed flow greater than 440 gpm UNTIL narrow range level greater than 10% [25% ADV] in at least one S/G. **IF** AFW flow greater than 440 gpm CANNOT be established, **THEN PERFORM** the following: 1) **MONITOR** status trees. 2) **GO TO** FR-H.1, Loss of Secondary Heat Sink.
	SRO	Directs BOP to suspend ES-0.5 performance, verify Status Trees' conditions
	BOP	Identifies Heat Sink RED path using 1-FR-0, recommends transition to FR-H.1, Loss of Secondary Heat Sink.
	Crew	FR-H.1 transition

Op Test No.: NRC 2010302 Scenario # 6 Event # 6, 7 Page 37 of 46

Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		FR-H.1 **Loss of Secondary Heat Sink**
	CAUTION:	Feeding an Intact or Ruptured S/G is preferred to feeding a Faulted S/G. Thermal stresses from feeding a Faulted S/G could rupture tubes, resulting in a Faulted-AND-Ruptured S/G.
	SRO	1. **DETERMINE** procedure applicability:
		a. **CHECK** the following: ***(RNO required)***
		• Total feed flow less than 440 gpm due to operator action directed by another procedure. **AND**
		• Total feed flow capability of greater than 440 gpm AVAILABLE.
		RNO: a. **GO TO** Step 2.
		2. **MONITOR** RWST level greater than 27%.
Evaluator Note:		The scenario intent is once the crew loops back to Step 3 an AFW pump will be restored following Feed & Bleed decision in step 5.
		3. **CHECK** if secondary heat sink required:
		a. RCS pressure greater than any non-Faulted S/G pressure.
		b. RCS temperature greater than 350°F.
		4. **MONITOR** at least one CCP available.
Evaluator Note:		At the **Lead Examiner's direction**, the TDAFWP will be restored to operation.
	NOTE:	Pressurizer pressure greater than or equal to 2335 psig with rising RCS temperature and a low loop delta-T indicates loss of heat removal capability.
		5. **MONITOR** RCS feed and bleed criteria: ***(RNO required 1st time through this step)***
		a. **CHECK** the following:
		• Any three S/G wide range levels less than 20% [41% ADV] **OR**
		• Pressurizer pressure greater than or equal to 2335 psig due to loss of secondary heat removal.
		b. **STOP** RCPs
		c. **GO TO** Caution prior to Step 17.

Op Test No.: NRC 2010302 Scenario # 6 Event # 6, 7 Page 38 of 46

Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		RNO: a. **GO TO** Step 6.
		6. **MONITOR** CST level greater than 5%.
		7. **ATTEMPT** to establish AFW flow to at least one S/G in the following order of priority-- Intact, Ruptured, Faulted:
		a. **CHECK** S/G blowdown isolation Valves CLOSED.
		b. **CHECK** control room indications for cause of AFW failure.
		• CST level
		• AFW pump power supply
		• AFW valve alignment
		c. **ESTABLISH** MD AFW pump flow:
		1) **ENSURE** MD AFW pumps RUNNING.
		2) **ENSURE** AFW level control valves OPEN.
		3) **ENSURE** MD AFW recirculation valves FCV-3-400 and FCV-3-401 CLOSED.
		d. **ESTABLISH** TD AFW pump flow:
		1) **ENSURE** turbine steam supply valves OPEN:
		• Either FCV-1-15 or FCV-1-16
		• FCV-1-17 and FCV-1-18
		• Trip and throttle valve, FCV-1-51.
		2) **ENSURE** AFW level control valves OPEN:
		3) **RAISE** TD AFW pump speed as necessary.
	NOTE: Continuous actions in Step 8 are NOT applicable after RCS feed and bleed is initiated in Step 17.	
		8. **MONITOR** for AFW flow:
		a. **CHECK** total AFW flow to S/Gs greater than 440 gpm ***(RNO required)***
		RNO: a. **IF** NO AFW flow can be verified, **THEN**:
		1) **ENSURE** personnel dispatched to locally restore AFW flow.

Op Test No.: NRC 2010302 Scenario # 6 Event # 6, 7 Page 39 of 46

Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		2) **GO TO** Step 9.
		IF AFW flow to at least one S/G verified,…**N/A**
Evaluator Note:		**Crew transitions to step 9 here.**
Evaluator Note:		**Critical Task: Manually Stop RCPs prior to FR-H.1 Step 9 completion**
Critical Task		9. **STOP** all RCPs.
		10. **MONITOR** shutdown boards continuously energized.
Evaluator Note:		MFPs and Condensate system are not available for SG feed due to the MFW leak location and isolation.
		11. **ATTEMPT** to establish MFW flow to at least one S/G…**N/A**
		a. **MFW … N/A**
		b. **CHECK** condensate system IN SERVICE: ***(RNO required)***
		RNO: b. **START** condensate system pumps… **IF** condensate system CANNOT be placed in service, **THEN GO TO** Step 16
		16. **CHECK** RCS feed and bleed criteria: ***(RNO required)***
		• Three S/G wide range levels less than 20% [41% ADV]. **OR**
		• Pressurizer pressure greater than or equal to 2335 psig due to loss of secondary heat removal.
		RNO: **GO TO** Step 3.
		3. **CHECK** if secondary heat sink required:
		a. RCS pressure greater than any non-Faulted S/G pressure.
		b. RCS temperature greater than 350°F.
Evaluator Note:		the crew is in a procedural "do" loop until at least 3 of 4 SGs are less than 20% **WIDE** range or some form of secondary make-up is restored. The scenario intent is once the crew loops back to Step 3 an AFW pump will be restored

Op Test No.: NRC 2010302 Scenario # 6 Event # 6, 7 Page 40 of 46

Event Description: Main Feedwater Header Break w/ AFW Malfunctions:1B-B MD and TDAFWPs vapor bound w/ TDAFWP trip

Time	Position	Applicant's Actions or Behavior
		following Feed & Bleed decision in step 5.

Lead Examiner may terminate the scenario following crew evaluation of FR-H.1 Step 5, Feed & Bleed determination during the 2nd pass through the procedure.

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Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
Evaluator Note:		**BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies/actions taken) to SRO.**
	BOP	1. **VERIFY** D/Gs RUNNING.
	BOP	2. **VERIFY** D/G ERCW supply valves OPEN.
	BOP	3. **VERIFY** at least four ERCW pumps RUNNING
	BOP	4. **VERIFY** CCS pumps RUNNING
		• Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	5. **VERIFY** EGTS fans RUNNING.
	BOP	6. **VERIFY** generator breakers OPEN.
	Crew	7. **NOTIFY** at least two AUOs to report to MCR to be available for local actions.
	BOP	8. **VERIFY** AFW pumps RUNNING: a. MD AFW pumps b. 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	9. 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 2010302	Scenario #	6	Event #	ES-0.5	Page	42	of	46
Event Description:	Equipment verifications								

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
Evaluator Note:	**Critical Task:**	Manually isolate/verify feedwater isolation prior to SG(s) inventory loss
Critical Task	BOP	10. **VERIFY** MFW Isolation: a. MFW pumps TRIPPED b. **ENSURE** the following: • **MFW regulating valves CLOSED** • **MFW regulating bypass valve controller outputs ZERO** • **MFW isolation valves CLOSED**
	BOP	11. **MONITOR** ECCS operation:
		a. **VERIFY** ECCS pumps RUNNING: • CCPs: • RHR pumps • SI pumps
		b. **VERIFY** CCP flow through CCPIT.
		c. **CHECK** RCS pressure less than 1500 psig.
		d. **VERIFY** SI pump flow.
		e. **CHECK** RCS pressure less than 300 psig.
		f. **VERIFY** RHR pump flow.
	BOP	12. **VERIFY** ESF systems ALIGNED:
		a. Phase A ACTUATED: • PHASE A TRAIN A alarm LIT [M-6C, B5]. • PHASE A TRAIN B alarm LIT [M-6C, B6].
		b. Cntmt Vent Isolation ACTUATED: • CNTMT VENT ISOLATION TRAIN A alarm LIT [M-6C, C5]. • CNTMT VENT ISOLATION TRAIN B alarm LIT [M-6C, C6].
		c. Status monitor panels: • 6C DARK • 6D DARK • 6E LIT OUTSIDE outlined area • 6H DARK • 6J LIT.

Op Test No.: NRC 2010302 Scenario # 6 Event # ES-0.5 Page 43 of 46

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		d. Train A status panel 6K: • CNTMT VENT GREEN • PHASE A GREEN
		e. Train B status panel 6L: • CNTMT VENT GREEN • PHASE A GREEN
	BOP	13. **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].
		d. **ENSURE** RCPs STOPPED.
		e. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN. • Panel 6L PHASE B GREEN.

Op Test No.: NRC 2010302 Scenario # 6 Event # ES-0.5 Page 44 of 46

Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		f. **WHEN** 10 minutes have elapsed, **THEN ENSURE** containment air return fans RUNNING.
		14. **MONITOR** if containment vacuum relief isolation valves should be closed:
		a. **CHECK** containment pressure greater than 1.5 psig.
		b. **CHECK** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48.
	BOP	15. **CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors (attached) • Appendix B, Containment Rad Monitors. (attached)
	BOP	16. **WHEN** directed by E-0, **THEN PERFORM** Appendix D, Hydrogen Mitigation Actions.
		17. **CHECK** 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	18. **DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	19. **ENSURE** plant announcement has been made regarding Reactor Trip and SI.

Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken per ES-0.5 Step 13) to SRO.

END (ES-0.5, EQUIPMENT VERIFICATIONS)

Op Test No.:	NRC 2010302	Scenario #	6	Event #	ES-0.5	Page	45	of 46
Event Description:	Equipment verifications							

(ES-0.5, EQUIPMENT VERIFICATIONS)		
APPENDIX A **SECONDARY RAD MONITORS**		
	BOP	1. **CHECK** following rad monitors including available trends prior to isolation: • Condenser exhaust recorder RR-90-119 • S/G blowdown recorder RR-90-120 • Main steam line rad monitors • Post-Accident Main Steam Line rad recorder RR-90-268B points 3 (blue), 4 (violet), 5 (black), and 6 (brown). [M-31 (back of M-30)]
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.
END OF TEXT		

APPENDIX B **CONTAINMENT RAD MONITORS**		
	BOP	1. **CHECK** following rad monitors: • Upper containment high range rad monitors RM-90-271 and RM-90-272 NORMAL [M-30] • Lower containment high range rad monitors RM-90-273 and RM-90-274 NORMAL [M-30] • Containment rad recorders RR-90-112 and RR-90-106 NORMAL [M-12] (prior to isolation).
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.
END OF TEXT		

Op Test No.:	NRC 2010302	Scenario #	1	Event #	Critical Task(s)	Page	46	of	46

Event Description: Critical Task Listing

Critical Tasks:	Critical Task Statement	Action Location	ESG pg #
1.	Manually isolate/verify feedwater isolation prior to SG(s) inventory loss Time critical action per 0-TI-OPS-000-004.0 r1	E-0 POAs	33 or 35
		ES-0.5 Step 10.b	42
2.	Manually Stop RCPs prior to FR-H.1 Step 9 completion	FR-H.1 Step 9	39

Sequoyah Nuclear Plant

Unit 1 & 2

General Operating Instructions

0-GO-5

NORMAL POWER OPERATION

Revision 0065

VFW
OPD,
today's date

Quality Related

Level of Use: Continuous Use

Effective Date: 03-12-2010

Responsible Organization: OPS, Operations

Prepared By: W. T. Leary

Approved By: P. R. Simmons

Current Revision Description

Revised to address requirements overlooked in the initial issuance of the guidance for compliance with NERC Reliability Standards, VAR-002. These changes make no alteration to the operation of any equipment and are changes to required administrative notifications only. These changes are therefore minor editorial changes as defined in SPP-2.2.

PERFORMANCE OF THIS PROCEDURE IMPACTS REACTIVITY.

Table of Contents

2.0 REFERENCES

2.1 Performance References

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

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

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

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

E. 1,2-SO-2-9, *Condenser Vacuum and Turbine Steam Seal Systems Operation*

F. 0-SO-12-1, *Auxiliary Boiler System*

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

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

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

J. 1,2-SO-62-1, *Chemical and Volume Control System*

K. 0-SO-62-7, *Boron Concentration Control*

L. 1,2-SO-62-9, *CVCS Purification System*

M. 0-SO-68-3, *Pressurizer Spray and Heater Pressure Control System*

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

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

P. 0-SI-OPS-092-078.0, *Power Range Neutron Flux Channel Calibration By Heat Balance Comparison*

Q. 0-SI-CEM-000-050.0, *72-Hour Chemistry Requirements*

R. 0-SI-CEM-030-407.2, *Radioactive Gaseous Waste Effluent Particulate and Iodine Dose Rates from Shield and Auxiliary Building Exhausts (Weekly/Special) and Condenser Vacuum Exhausts (Special)*

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

T. 0-SI-OPS-000-001.0, Initial Startup System Parameter Log

U. TI-40, *Determination of Preconditioned Reactor Power*

2.1 Performance References (continued)

V. 2-SO-98-1, *Distributed Control System*

2.2 Developmental References

A. Memorandum from System Engineering concerning MSR operation - RIMS S57 880322 999

B. Memo from Reactor Engineering - RIMS S57 941219 934

C. S57-880322-999 and S57-880808-851

D. W Letter GP89-076 (RIMS No. S53 890427 984)

E. W Letter GP 89-155 (RIMS S57 891026 972)

F. W Letter GP 86-02(B44 861112 002)

G. SSP-2.3, *Administration of Site Procedures*

H. TVA-NQA-PLN89-A

I. GOI-10, *Reactivity Control at End of Cycle Life* (Trojan Nuclear Plant)

J. FSAR, Section 13.5

K. Memo from Reactor Engineering - August 6, 1996 (G Bair)

L. NERC Reliability Standard, VAR-002-1.1b

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

A. To ensure that NIS Reactor Power level indications remain within 2% of true power during power level changes, a check should be performed about every 20% power level change, when greater than 15% power, by comparing calorimetric power to each NIS Power Range drawer. The 20% power level check does not preclude the operating crews from making necessary changes in response to changing plant conditions.

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 or equal to 250°F.

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

C. The following should be used to determine the most accurate reactor power indication for comparison with NIS:

- When reactor power is greater than 15%, use LEFM calorimetric power indication (U2118).
- If LEFM is NOT available, then use average loop ΔT (UO485 or M-5 indicators) up to 40%. Above 40%, use computer point U1118.

D. 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 Ltr GP 89-155; RIMS S57 891026 972)

E. Pressurizer heaters and sprays may be operated as required to maintain pressurizer and RCS boron concentration within 50 ppm. If loop boron concentration is changed by 20 ppm or greater, use the pressurizer backup heaters to initiate automatic spray (if available). If Normal Spray is NOT available, then use Auxiliary Spray (1, 2-SO-62-1, Section 8.7) in conjunction with pressurizer backup heaters.

3.1 Precautions (continued)

3. If not performed at 75% hold point, an axial imbalance comparison and a detector calibration (if Δ AFD ≥ 3%) should be performed at ~ 100% RTP. Engineering will determine if PR NIS calibration must be performed. Calorimetric calculations, RCS flow verification, a hot channel factor determination, and a reactivity balance will be performed and EAGLE-21 updated. Reactor Engineering will notify Operations that normal full power operations may proceed.

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

5. 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.

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

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

   b. 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.

   c. 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.*

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

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

L. Declared fuel defects, as determined by the Fuel Reliability Assessment Team or the Shift Manager, have limited ramp rates during Reactor Power increases as specified in TI-40.

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M. TI-40 power increase limits that are exceeded, in any one hour, are evaluated in accordance with SPP-3.1.

3.1 Precautions (continued)

N. Power Coastdown At End Of Life:

N/A

1. Reactor power changes should be limited to less than or equal to 1% per hour to avoid causing xenon peaking which could force a plant shutdown.

2. Do not perform unnecessary unit power maneuvers or testing (e.g., turbine valve testing). Such testing could result in an uncontrollable Xenon oscillation.

3. Nonessential work on systems which could cause a plant upset should be deferred.

4. Secondary Plant runbacks such as Main Feed Pump Turbine trip or #3 Heater Drain Tank runback will require a unit shutdown if Reactor power is not promptly returned to pre-transient level due to the resulting severe Xenon transient. If a system power alert is in effect, and electrical generation is critical, unit load should be reduced as necessary keeping T_{AVG} on program. Contact Reactor Engineering for an evaluation and guidance concerning unit shutdown or reduction of load.

5. Management should be consulted to evaluate the feasibility of a unit restart if a reactor trip occurs with RCS equilibrium boron concentration less than 50 ppm. If the reactor is to be restarted, the power level shall be limited to nominal pre-trip power level.

O. Axial Flux Difference Management:
When the reactor is operating at a steady power or during normal load changes, maintain ΔI within the operating limits of the Core Operating Limits Report (COLR). It is recommended that the core axial flux difference (AFD) be maintained within ± 5% of the target band at all times, excluding the performance of 0-PI-NUC-092-036.0, "Incore - Excore Calibration," and End of life power coast downs. Operating time outside the band, which is given in TI-28 Attachments 1 and 2, should be minimized. Reactor Engineering should be contacted if time out of the ± 5% target band exceeds approximately 30 minutes.

P. The position of control 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 5 steps below this guidance for long term, then impact may occur to safety analysis assumptions.

Q. During heatup and cooldown transients, RCS density changes will cause changes in NIS indicated power. At constant reactor power, a 1°F change in T_{AVG} may cause as much as a 1% (or more) change in indicated NIS power.

3.1 Precautions (continued)

R. The following limitations are applicable to Unit Two ONLY.

N/A 1. In winter months #7 HDTP capacity is not adequate to pump #6 Heater drains when all Condensate Demineralizer pumps are in service. Current practice is to run two Cond DI Pumps and / or throttle the condensate system to reduce backpressure. The preferred method is to throttle condensate pressure instead of running only two Condensate Demineralizer booster pumps at full power due to pump runout concerns.

2. Siemens-Westinghouse analysis has determined that the maximum unit power with one MFP operation is 65% under worst case conditions. The plant could operate higher if plant conditions permit.

3. MFP flow from the lead MFP should not exceed 53.7% of the total flow. Flow rates above this would result in HP steam flow to the lead MFPT. Computer points 1(2)UO504 and UO505 can be used to monitor.

S. Voltage Control

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Operation of the Main Generator without Automatic Voltage Control could impact grid voltage requirements. Refer to GOI-6 for MVAR limits.

2. When the Main Generator is connected to the grid, the voltage regulator shall be operated in Automatic, unless coordinated with the Transmission Operator (SELD).

3. Main Generator operation outside of the Transmission Voltage Schedule requires coordination with the Transmission Operator, and notation in the operator's Log of time, reason, and that the Transmission Operator notification was made.

4. When directed to modify voltage, the Generator Operator shall comply (within plant procedural requirements) or provide an explanation of why the schedule cannot be met.

5. While the Main Generator is tied to the grid perform the following:

   a. The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between AUTO and Manual as soon as practical but notification shall be within 30 minutes.

3.1 Precautions (continued)

b. The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfers between Manual and Auto.

c. All position changes (to and from Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration and notifications made.

T. Reliability Directives and Protective Relay/Equipment Failures

> **NOTE**
>
> Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Plant Operations shall notify the Transmission Balancing Authority (BA) or Transmission Operator of protective relay or equipment failures that creates a creditable risk to Plant Generation. A creditable risk to generation represents a potential reduction in transmission system reliability.

2. Reliability Directives to the Generator Operator are via the Balancing Authority or Transmission Operator. Required action time may range from immediate to no longer than 30 minutes. Actions shall be taken without delay. The directives may be associated with preventing or clearing Local System issues, or neighboring system issues.

3. Plant operations shall take timely actions as directed by the Balancing Authority or Transmission Operator to mitigate critical conditions to return the bulk electrical system to a reliable state. Plant operations shall comply with Balancing Authority or Transmission Operator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements.

4. Plant Operations shall immediately inform the Balancing Authority or Transmission Operator of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

3.2 Limitations

A. When the axial flux difference monitor alarm is inoperable, the AFD must be logged every hour by performing 0-SI-NUC-000-044.0.

(SR 4.2.1.1.a.2 & 4.2.1.1.b)

B. When both the plant computer and NIS QPTR alarm systems are inoperable, the QPTR must be calculated every 12 hours by performing 0-SI-NUC-000-133.0. (SR 4.2.4.1.b)

C. Do not exceed a load change rate of plus or minus 5% per minute or a step change of 10%.

D. River water temperatures shall be maintained within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0.

> **NOTE**
>
> Westinghouse should be contacted if the turbine is operated outside of its operating limits as stated below.

E. To prevent high vibratory stresses and fatigue damage to the last stage turbine blading, do not operate the turbine 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)

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.

F. Do not allow the generator to become underexcited.

G. 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 0-SI-CEM-000-050.0, 0-SI-CEM-030-407.2 and 0-SI-CEM-000-415.0 due to the thermal power change.

3.2 Limitations (continued)

H. The following Main Turbine vibration limitations and actions should be adhered to:

1. Vibration levels which exceed 7 mils (alarm setpoint) should be verified by Predictive Maintenance Group.
2. Vibration levels greater than 7 mils and less than 14 mils should be continuously monitored by Predictive Maintenance Group.
3. IF vibration level is greater than or equal to 14 mils, THEN TRIP the turbine.

I. Westinghouse recommends that if any throttle valve is held closed for more than 10 minutes, then it should be re-tested immediately upon reopening in accordance with 1,2-PI-OPS-047-002.0.

J. The generator may be operated without a bus duct cooler up to approximately 729 MW turbine load.

K. To ensure sufficient voltage for a safe shutdown after loss of both units, voltage and reactive power should be maintained within the limits of GOI-6.

L. With LEFM calorimetric power indication available, full power operation is defined as approximately 3455 MW_T not to exceed 3455.0 MW_T averaged over a 8-hour period. [C.1] If LEFM is available, power shall be monitored using plant computer point U2118 Instantaneous Value. **DO NOT** allow average thermal power to exceed 3455 MW thermal for two consecutive hours. Every effort should be made to maintain core thermal power 10 minute average less than 3455 MWt.

M. The following restrictions apply if LEFM calorimetric power indication (U2118) is unavailable:

1. Applicable action of TRM 3.3.3.15 must be entered.
2. AFD limits in COLR and TI-28 must be made more restrictive by 1%.
3. Rod insertion limits in COLR must be raised by 3 steps.
4. If reactor power is greater than 40%, power should be monitored using U1118. If U1118 is also unavailable, use the highest reading NIS channel.
5. If reactor power is less than 40%, use the RCS average ΔT as the preferred method for determining power level.

3.2 Limitations (continued)

N. IF equilibrium conditions are achieved, after exceeding by 10% or more of rated thermal power the thermal power at which the heat flux hot channel factor was last determined, THEN conditional performance of 0-SI-NUC-000-126.0, Hot Channel Factor Determination is required.

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. With one LP heater string out of service (isolated), power is limited to 86% (Unit 1) or 90% (Unit 2). This is based on LP turbine blading limitations. (Ref: DCN E21203A).

Q. #3 heater drain tank should remain drained with LCV-6-105A and B failed open (per 1, 2-SO-5-2) until reactor power exceeds ~45-50%. This will prevent intermediate heater string isolations if a turbine trip occurs at lower power levels. If a level is established in the number 3 Heater Drain Tank prior to exceeding P-9 setpoint (50% power), a turbine trip will result in Intermediate Pressure Heater string isolation(s).

STARTUP No. N/A **Unit** 1 **Date** today

4.0 PREREQUISITES

NOTES

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

2) Prerequisites may be completed in any order.

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

[2] T_{AVG} is being maintained within 1.5°F of T_{REF}. ☑

[3] SG level controls are being maintained in AUTO (**N/A** if auto control **NOT** available). ☑

[4] Control rods are being maintained within the operating band of Core Operating Limits Report (COLR) (**N/A** if shutting down due to dropped or misaligned rod). ☑

[5] Steam dump control system is in the T_{AVG} mode (**N/A** if Tavg Mode **NOT** available). ☑

[6] The EHC system should be in OPER AUTO (pushbutton lit). ☑

[7] Generator pressurized with hydrogen according to capability curve. (TI-28, Fig. A.I4) ☑

[8] PRMs are being maintained within ±2% of core thermal power readings. ☑

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. N/A

STARTUP No. 1 **Unit** 1 **Date** Today

4.0 PREREQUISITES (continued)

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

Print Name	Initials
Sr Reactor Operator	SRO
Reactor Operator 1	RO1
Reactor Operator 2	RO2
Reactor Engineer	RE
Chem Super	CS

* Multiple pages & steps N/A'd as they were previously performed. This procedure is being used to raise power of unit 1 from ≈ 75% to 100% power SRO today

5.0 INSTRUCTIONS

CAUTION

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

NOTES

1) Radiation Protection should be notified during normal plant operations if power level increases or decreases are either stopped or started.

2) Guidance on restoration of EHC Controls after a BOP runback is contained in Appendix B, *Turbine Runback Restoration.* [C.4]

STARTUP No. n/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100%

NOTES

1) Failure to comply with the NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.
2) The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]
3) The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.
4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.
5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.
6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made.
7) 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 30 minutes.
8) Confirmation from Chemistry Section **SHALL** be obtained prior to exceeding **30%** reactor power.

[1] **ENSURE** Section 3.0 Precautions and Limitations has been reviewed and Section 4.0, Prerequisites complete. SRO

[2] **VERIFY** from Chemistry Section that SG and feedwater secondary chemistry is within acceptable limits. ☑

Chem Supv

Chemistry personnel contacted

[3] **IF** this is a startup following refueling, **THEN**

ENSURE applicable portions of 0-RT-NUC-000-001.0 are **COMPLETE** for operation above 35% power. N/A

Rx Engr.

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) This step may be performed out of sequence as necessary to meet power level.

2) 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.

[4] **PERFORM** the following at approximately 35% reactor power:

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

CALCULATE Calorimetric power:

Calorimetric power= U2118 $\frac{N/A}{34.55}$ = N/A %

N/A

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

CALCULATE reactor power:

Average value of RCS ΔT (U0485)= N/A % N/A

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

N-41	(XI-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 ☐

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

PERFORM 0-SI-OPS-092-078.0.

STARTUP No. N/A **Unit** 1 **Date** 7Oct04

5.1 Power Ascension From 30% to 100% (continued)

[4.5] **MONITOR** PRMs deviation from core thermal power continuously during performance of this procedure
AND
PERFORM 0-SI-OPS-092-078.0 if the deviation is >2%. _______

NOTES

1) With reactor engineering concurrence, power increase per steps 5.1[6] through 5.1[10] may be performed in parallel with this step.

2) If startup is following refueling operations and secondary side chemistry is acceptable for power increase, then N/A Step 5.1[5]. (Startup Reactivity Calibrations and Tests will be performed at ≈ 45% Reactor Power if not performed at ≈ 30% Power).

[5] **IF** startup is following refueling activities and secondary chemistry hold is precluding power ascension, **THEN**

ENSURE the following have been performed prior to exceeding 50% rated thermal power: (May be performed in any order)

[5.1] 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

N/A Rx Eng N/A Date

[5.2] 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

_______ Rx Eng _______ Date

[5.3] 0-PI-NUC-092-002.0, Detector Single Point Alignment.

_______ Rx Eng _______ Date

STARTUP No. N/A **Unit** ~~1010~~ 1[illegible] **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[5.4] 0-PI-IXX-092-N45.0, PR NIS Calibration.

N/A MIG N/A Date

[5.5] PR High Flux Trip reset to 109%. [C.3].

MIG Date

[5.6] Applicable portions of 0-RT-NUC-000-001.0 **COMPLETE** for operation above 50% power.

Rx Eng Date

[6] **DETERMINE** the following from TI-40 and **RECORD** in narrative log and below:

[6.1] Reactor preconditioned power level. N/A ☐ N/A

[6.2] Ramp rate restrictions: ☐

N/A %/hour up to N/A % reactor power

%/hour up to % reactor power

%/hour up to % reactor power

[6.3] Restrictions on AFD and rod withdrawal rate: ☐
(N/A if not applicable)

[7] **VERIFY** TI-40 limits listed above.

Rx Eng

SM

[8] **MONITOR** TI-40 limits (using ICS trend features if available). ☐

STARTUP No. N/A **Unit** 1 **Date** [illegible]

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> Raising load on the Main Generator will cause VARs to trend in the negative direction (toward incoming). This will require raising generator voltage. Refer to GOI-6 Section E for MVAR limits for generator stability. Refer to precautions R, S, T, and V.

[9] **PERFORM** the following as required:

[9.1] IF Automatic Voltage Control is in service,
THEN
ADJUST Main Generator VARs **USING**
<u>[HS-57-22]</u> Exciter Voltage Auto Adjuster as necessary during power escalation. N/A

[9.2] **IF** necessary to remove Automatic Voltage Control from service,
THEN
PERFORM required steps in Appendix E.

[9.3] IF Automatic Voltage Control is NOT in service,
THEN
ADJUST Main Generator VARs **USING**
<u>[HS-57-23]</u> Exciter Voltage Base Adjuster as necessary during power escalation.

> **NOTES**
>
> 1) Steps 5.1[10] through 5.1[16] may be performed concurrently or out of sequence.
>
> 2) Valve position limit and governor control meter are displayed on EHC Display panel 1,2-XX-047-2000 (M-2).
>
> 3) 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.

[10] **INITIATE** power increase to between 45 and 49% and

MAINTAIN valve position limit approximately 10% above current governor control indication as turbine load is changed. ☐ NA

STARTUP No. N/A Unit 1 Date today

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> The turbine load increase should be stopped until the MFW Reg valves are operating in the acceptable band.

[12.5] **ENSURE** MFW Reg valves are operating properly in auto (within ± 5% from zero deviation is acceptable). N/A ☐

[12.6] **IF** MFW Reg. valves are NOT maintaining within the 5% band, THEN

NOTIFY Instrument Maintenance. ☐

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

> **NOTE**
>
> Instrument Maintenance support may be required if controller adjustments are needed.

[12.7] **ENSURE** Feedwater Heaters 5 and 6, MSR Drain Tank, and #7 Heater Drain Tank level controllers are adjusted to maintain levels within normal ranges. ☐

[13] **WHEN** reactor power is approximately 35%, **THEN**

VERIFY annunciator XA-55-4A, window C-5:

P-8 LOW POWER LOW FLOW TRIP BLOCK

is **DARK**. ☑

[14] **IF** unit is returning to service after a power reduction and the MSRs were removed from service, **THEN**

PLACE MSR HP steam warming valves to **OPEN** position:

STARTUP No. N/A Unit 1 Date

5.1 Power Ascension From 30% to 100% (continued)

MSR	HANDSWITCH	WARMING VALVE	INITIALS	
A1	HS-1-142	FCV-1-142	N/A 1st	N/A CV
B1	HS-1-144	FCV-1-144	1st	CV
C1	HS-1-146	FCV-1-146	1st	CV
A2	HS-1-136	FCV-1-136	1st	CV
B2	HS-1-138	FCV-1-138	1st	CV
C2	HS-1-140	FCV-1-140	1st	CV

NOTE

#3 heater drain tank should remain drained with LCV-6-105A and B full open until reactor power exceeds ~45-50%.

[15] **ENSURE** #7 heater drain tank is on recirc in accordance with 1,2-SO-5-3. N/A ☐

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

[16.1] Condensate booster pumps. ☐

[16.2] Hotwell pump. ☐

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) When placing additional condensate pumps in service, or HDT pumps in service, ensure that the MFW Reg. valves respond correctly and then stabilize in the acceptable band.

2) The following step may be performed out of sequence and may be marked N/A if it was previously performed in 0-GO-4.

[17] **WHEN** the condensate booster pump reaches approximately 140 amps, **THEN**
START the following pumps in accordance with 1,2-SO-2/3-1:

[17.1] Third HW pump (if available). N/A

[17.2] Second CBP. _____

NOTES

1) When placing additional condensate pumps or HDT pumps in service, ensure that the MFW Reg. valves respond correctly and then stabilize in the acceptable band.

2) With approval from Ops Superintendent, pumping forward of #7 Heater Drain System may be deferred until turbine load is approximately 60%, if system conditions warrant.

3) Steps 5.1[18] through 5.1[23] may be performed out of sequence.

[18] **WHEN** confirmation obtained from Chemistry Section that #7 heater drain tank chemistry is in limits, **THEN**

START pumping forward using the #7 heater drain tank pumps using 1,2-SO-5-3. _____

[19] **MAINTAIN** Condensate Booster Pump suction pressure greater than or equal to 75 psig (PI-2-77). ☐

[20] **MAINTAIN** Main Feedwater Pump suction pressure greater than 330 psig (PI-2-129). ☐

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[21.2] **CLOSE** the following steam inlet leakoff isolation valves:

MSR	VALVE	POSITION	INITIALS
A-1	1-679	CLOSED	N/A
	1-714	CLOSED	
B-1	1-680	CLOSED	
	1-715	CLOSED	
C-1	1-681	CLOSED	
	1-716	CLOSED	
A-2	1-682	CLOSED	
	1-717	CLOSED	
B-2	1-683	CLOSED	
	1-718	CLOSED	
C-2	1-684	CLOSED	
	1-719	CLOSED	

NOTE

Due to interlocks on MSR valves, bypass valves must be opened prior to main isol valves. For example: Open FCV-1-241 and when full open, then open FCV-1-141.

[21.3] **ENSURE** MSR HP steam supplies ALIGNED as follows:

MSR	EQUIPMENT	HANDSWITCH	POSITION	√
A1	MSR BYPASS ISOL	HS-1-241A	OPEN	N/A ☐
	MSR MAIN ISOL	HS-1-141A	OPEN	☐
B1	MSR BYPASS ISOL	HS-1-243A	OPEN	☐
	MSR MAIN ISOL	HS-1-143A	OPEN	☐
C1	MSR BYPASS ISOL	HS-1-245A	OPEN	☐
	MSR MAIN ISOL	HS-1-145A	OPEN	☐
A2	MSR BYPASS ISOL	HS-1-235A	OPEN	☐
	MSR MAIN ISOL	HS-1-135A	OPEN	☐
B2	MSR BYPASS ISOL	HS-1-237A	OPEN	☐
	MSR MAIN ISOL	HS-1-137A	OPEN	☐
C2	MSR BYPASS ISOL	HS-1-239A	OPEN	☐
	MSR MAIN ISOL	HS-1-139A	OPEN	☐

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Control valves ramp open for 120 minutes for turbine cold start.

2) MSR Control valves ramp open from the 400°F position to full open in one hour when Hot Start button was previously depressed during performance of 0-GO-4 or 0-GO-11.

[21.4] **DEPRESS** the RAMP pushbutton on the moisture separator reheater control panel to initiate steam flow to the reheater. N/A ☐

[21.5] **IF** MSR controls will NOT function in RAMP mode, **THEN**
PERFORM the following:

- A. **DEPRESS** MANUAL pushbutton on MSR control panel. ______
- B. **ADJUST** manual potentiometer to gradually open MSR TCVs over approx. 120 minutes **WHILE** continuing in this procedure. ______

[21.6] **OPEN** all MSR OPERATING vents (6-3 thru 6-93) on panel XS-6-3. ______

[21.7] **CLOSE** all MSR STARTUP vents (6-1 thru 6-91) on panel XS-6-1. ______

[21.8] **PERFORM** App. C to locally isolate MSR startup vents. ______

[21.9] **ENSURE** MSR HP steam warming valves are CLOSED:

MSR	EQUIPMENT	HANDSWITCH	POSITION	√
A1	MSR WARMING LINE	HS-1-142	CLOSED	N/A ☐
B1	MSR WARMING LINE	HS-1-144	CLOSED	☐
C1	MSR WARMING LINE	HS-1-146	CLOSED	☐
A2	MSR WARMING LINE	HS-1-136	CLOSED	☐
B2	MSR WARMING LINE	HS-1-138	CLOSED	☐
C2	MSR WARMING LINE	HS-1-140	CLOSED	☐

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[21.10] **IF** this power ascension is during the months of October 1 through March 31, **THEN**

REFER to 0-PI-OPS-000-006.0 and consult System Engineer for position of MSR doghouses' vent dampers. N/A

[21.11] **IF** this power ascension is during the months of April 1 through September 30, **THEN**

OPEN MSR doghouses' vent dampers. N/A

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.

[22] **IF** #7 heater drain tank (HDT) pressure is indicating an overpressure condition, **THEN**

PERFORM 1,2-SO-5-3, Section 8.0, Infrequent Operation to prevent #7 HDT overpressurization. N/A

[23] **WHEN** approximately 40% turbine load:

[23.1] **VERIFY** annunciator XA-55-4A, window E-7:

C-20 AMSAC ARMED

is **LIT**. ☐ N/A

[23.2] **CLOSE** the drains on the operating main feedwater pump turbine (N/A other pump).

MFPT	DESCRIPTION	HANDSWITCH	POSITION	INITIALS
A	DRAIN VALVES	HS-46-14	CLOSED	N/A
B	DRAIN VALVES	HS-46-41	CLOSED	N/A

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) With verbal approval from the Operations Superintendent, placing the second main feed pump in service may be deferred until power is approximately 55% (Unit 1) or 65% (Unit 2). Logic prevents opening the standby MFPT condenser isolation valves if the pump is **NOT** reset prior to exceeding 9 million lbs/hr flow on the running pump.

2) LCO 3.3.2.1 (3.3.2) functional unit 6.f (AFW start function for the trip of both MFPT) allows one channel to be inoperable in Mode 1 for up to 4 hours when starting up or shutting down the second MFPT.

[24] **WHEN** approximately 40 to 45% turbine load, **THEN**

PLACE second MFPT in service by performing the following:

[24.1] **IF** the Operations Superintendent has approved one MFP operation during the power ascension, **THEN**

A. **RECORD** which MFPT is in service.
MFPT ________ N/A

B. **MONITOR** loading of the MFP in service as load is increased. ☐

[24.2] **WHEN** second **MFPT** is to be placed in service, **THEN**

PLACE second MFPT in service in accordance with 1,2-SO-2/3-1. ☐

NOTE

This step and individual substeps may be performed out of sequence.

[25] **PERFORM** the following as system parameters permit:

[25.1] **VERIFY** three (3) Hotwell pumps running (if available). ☐

[25.2] **VERIFY** two (2) Condensate booster pumps running. ☐

[25.3] **VERIFY** MFW pump(s) in service (only 1 required if approved by Operations Superintendent). ☐ ✓

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[25.4] **VERIFY** one (1) #7 Heater Drain Tank pump in service. N/A ☐

[25.5] **ENSURE** one gland steam exhauster running and one stopped in AUTO position:

EXHAUSTER	HANDSWITCH	(√)	(√)
A	HS-47-209A	AUTO ☐	START ☐ N/A
B	HS-47-209B	AUTO ☐	START ☐ N/A

[25.6] **IF** gland seal water is being supplied from opposite unit, **THEN**

RESTORE normal gland seal water alignment (supplied from this unit) in accordance with 1,2-SO-37-1, Gland Seal Water System. N/A ☐

NOTE

Steps 5.1[26] through 5.1[31] may be performed out of sequence.

[26] **IF** the second #7 heater drain tank pump has not been started, **THEN**

START the second #7 heater drain tank pump in accordance with 1,2-SO-5-3. ______

NOTE

Hydrogen pressure should be maintained greater than or equal to 66 psig.

[27] **ENSURE** generator hydrogen pressure is sufficient for anticipated load in accordance with TI-28, Figure A.14, Generator Capability Curve. ______

[28] **VERIFY** river water temperature within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0. ☑

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

After refueling operations, NIS indications may be inaccurate until calibration at higher power levels. DO NOT increase power greater than 50% until Rx Engineering has ensured that applicable portions of 0-RT-NUC-000-001.0 are complete.

[29] **IF** applicable portions of 0-RT-NUC-000-001.0 are complete for power increase above 50% of rated thermal power, **THEN** **N/A** the following Step 5.1[30]. (Reactor Engineering) N/A

[30] **IF** startup is following refueling activities, **THEN** **ENSURE** the following performed prior to exceeding 50% thermal power: (may be performed in any order)

A. 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

N/A
Rx Eng ______ Date ______

B. 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

Rx Eng ______ Date ______

C. 0-PI-NUC-092-002.0, Detector Single Point Alignment.

Rx Eng ______ Date ______

D. 0-PI-IXX-092-N45.0, PR NIS Calibration..

MIG ______ Date ______

E. PR High Flux Trip reset to 109%. [C.3].

MIG ______ Date ______

F. Applicable portions of 0-RT-NUC-000-001.0 **COMPLETE** for operation above 50% power.

Rx Eng ______ Date ______

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[31] **WHEN** reactor power is approximately 49%, **THEN**

PERFORM the following: (in any order).

[31.1] **ENSURE** indicated Axial Flux Difference is within the limits specified in the COLR (TS 3.2.1.1). N/A

[31.2] **PERFORM** a conditional 0-SI-NUC-000-044.0, *Axial Flux Difference*. ______

NOTE

QPTR alarms pertain to the plant computer and annunciator panel AR-M4-B, windows B-3, C-3, and D-4. Alarms may sporadically occur at 1.5% when the setpoint is 2%.

[31.3] **PERFORM** a conditional 0-SI-NUC-000-133.0, *Quadrant Power Tilt Ratio*. ______

[31.4] **IF** QPTR exceeds 1.015,
THEN
CONTACT Reactor Engineering for evaluation. ______

[32] **DETERMINE** the following from TI-40 and **RECORD** in narrative log and below:

[32.1] Reactor preconditioned power level. N/A ☐

[32.2] Ramp rate restrictions: ☐

N/A %/hour up to N/A % reactor power
______ %/hour up to ______ % reactor power
______ %/hour up to ______ % reactor power

[32.3] Restrictions on AFD and rod withdrawal rate: (N/A if not applicable) ☐

____

____

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[33] **VERIFY** TI-40 limits listed above.

N/A
Rx Eng

SM

[34] **CONTINUE** reactor power ascension to 74%. ☐

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[35] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

NOTE

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

[36] **MONITOR** the turbine load increasing and

MAINTAIN valve position limit approximately 10% above current governor control indication as turbine load is changed. ☐

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> Steps 5.1[37] through 5.1[40] may be performed out of sequence.

[37] **WHEN** greater than or equal to 50% reactor power, **THEN**

[37.1] **VERIFY** annunciator XA-55-4A, window E-4:

P-9 LOW POWER **TURB TRIP-REAC** **TRIP BLOCK**

is **DARK.**

N/A

[37.2] **PLACE** #3 Heater Drain Tank Pumps on recirc **USING** 1, 2-SO-5-2, No. 3 Heater Drain Tank and Pumps. ☐

[37.3] **VERIFY** annunciator XA-55-4B, window B-3:

NIS POWER RANGE **UPPER DETECTOR** **HI FLUX DEVN OR** **AUTO DEFEAT**

is **DARK.** ☐

[37.4] **VERIFY** annunciator XA-55-4B, window C-3:

NIS POWER RANGE **LOWER DETECTOR** **HI FLUX DEVN OR** **AUTO DEFEAT**

is **DARK.** ☐

[37.5] **VERIFY** annunciator XA-55-4B, window D-4:

COMPUTER ALARM **ROD DEV & SEQ** **NIS PWR RANGE** **TILTS**

is **DARK.**

[37.6] **U2 ONLY: ENSURE** MFW Bypass valves in MANUAL and CLOSED. ☑

STARTUP No. N/A **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

#3 and #7 heater drains must be pumping forward prior to exceeding 60% turbine load. This load limit assumes that both MFW pumps are in service. If only one MFWP is running, turbine load must be further limited to maintain adequate MFWP suction pressure.

[43] **PERFORM** the following PRIOR TO increasing turbine load above 60%.

[43.1] **ENSURE** #3 Heater Drain Tank pumping forward **USING** 1, 2-SO-5-2. N/A

[43.2] **ENSURE** #7 Heater Drain Tank pumping forward **USING** 1, 2-SO-5-3. ______

[44] **ENSURE** at least one bus duct cooler is in service **USING** 0-SO-58-1 PRIOR TO increasing load above 729 MWe. ______

NOTES

1) TI-40 ramp rate restrictions are recorded in Step 5.1[32].

2) The following step may be marked N/A if intermediate power threshold is NOT applicable.

[45] **WHEN** Reactor Power approaches the Intermediate Power Threshold for the respective unit, **THEN**

ENSURE Reactor Power ramp rate target is **ESTABLISHED** at 2% / hr.

Intermediate Power Threshold value N/A ______

STARTUP No. N/A Unit 1 Date [illegible]

5.1 Power Ascension From 30% to 100% (continued)

CAUTIONS

1) **Valves 106A and 106B shall be verified to be operating properly after each #3 HDT pump start.**

2) **At approximately 79% turbine load with LCV-6-105A or B open and only two #3 HDT pumps are in service, the available NPSH for the MFP will be insufficient.**

NOTES

1) When placing HDT pumps in service, ensure main feedwater pumps and main reg valves respond correctly and then stabilize in an acceptable band.

2) LCV-6-105A will come open at about 70% turbine load if condensate discharge pressure is high. Minimize duration at this load to reduce wear on the valve. As load is increased to 100% condensate pressure will gradually decrease allowing the #3 HDT pumps to pump forward and the condenser bypass valve(s) to close.

3) Steps 5.1[46] through 5.1[49] may be performed in any order.

[46] **WHEN** approximately 70% turbine load, **THEN**

[46.1] **PLACE** the third #3 heater drain pump in service in accordance with 1,2-SO-5-2. [C.2] N/A

[46.2] **ENSURE** valves LCV-6-106A and LCV-6-106B are controlling #3 heater drain tank level properly.

STARTUP No. N/A **Unit** 1 **Date** Jody

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Evaluate starting and stopping of Condensate Demineralizer pumps using condensate pressure, MFP inlet pressure, condensate booster pump inlet pressure, and #3 and #7 HDT pump and bypass valve operation. The US/SRO may start or stop Condensate Demineralizer pumps at his discretion, but if any of the following occurs the pumps must be started:

1) Condensate Booster Pump suction pressure is less than 125 psig, as indicated on [PI-2-77].

2) Main Feedwater Pump suction pressure less than 420 psig, as indicated on [PI-2-129].

3) Injection Water Pump discharge pressure is less than 265 psig, as indicated by an alarm on XA-55-3B window E-1.

NOTES

1) Should #7 heater drain tank pump(s) amps swing or if system pressure needs to be increased by approximately 40 psig, then Cond DI Booster pumps can be started; however, two of the three pumps must be started at the same time.

2) When placing condensate pumps in service, ensure MFW Reg. valves respond correctly and then stabilize in an acceptable band.

[47] **EVALUATE** starting two condensate demineralizer booster pumps in accordance with 1,2-SO-2/3-1 (This step can be N/A'd or signed-off at time when pumps are started). N/A

NOTE

If starting up following refueling operations and reactivity calculations and tests were completed at ≈ 30% reactor power, then reactivity calculations and tests must be performed again at ≈ 75% RTP.

[48] **IF** all applicable portions of 0-RT-NUC-000-001.0 are complete for power increase above 75% of rated thermal power, **THEN**

N/A the following Step 5.1[49]. (Reactor Engineering) RB

See Note page 16 of 100
RB Jody

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

After refueling, NIS indications may be inaccurate until calibration at higher power levels. DO NOT increase power above 75% until applicable portions of 0-RT-NUC-000-001.0 are complete.

Enter Here SRO today

See Notes on pg 16 of 100 SRO today

[49] **IF** startup is following refueling, **THEN**

PERFORM the following prior to operation above 75% power: (may be performed in any order)

[49.1] **ENSURE** the following have been performed (may be N/A'd by Reactor Eng. and Instrument Maint. if NOT required):

A. 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

_______ Rx Eng _______ Date

B. 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

RE Rx Eng today Date

C. 0-PI-NUC-092-036.0, Incore/Excore Detector Calibration (**N/A** if **NOT** required or if ΔAFD < 3%).

N/A RE Rx Eng today Date

D. 0-PI-NUC-092-002.0, Detector Single Point Alignment.

N/A RE Rx Eng today Date

E. 0-PI-IXX-092-N45.0, PR NIS Calibration.

N/A RE Rx Eng today Date

STARTUP No._________ Unit _____ Date _________

5.1 Power Ascension From 30% to 100% (continued)

[49.2] **NOTIFY** Systems Eng to perform 0-PI-SXX-000-022.2 to check RCS Loop ΔT Zeros. [C.7] ☐

[49.3] **ENSURE** applicable portions of 0-RT-NUC-000-001.0 are complete for operation above 75% RTP. ________ Rx Engr.

NOTES

1) 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.

2) Steps 5.1[50] and 5.1[51] may be performed out of sequence.

[50] **PERFORM** the following at approximately 75% reactor power:

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

CALCULATE Calorimetric power:

Calorimetric power= $\frac{\text{U2118 \_\_\_\_\_\_\_}}{34.55}$ = _______% ☐

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

CALCULATE reactor power:

Calorimetric power= $\frac{\text{U1118 \_\_\_\_\_\_\_}}{34.11}$ = _______% ☐

[50.3] **VERIFY** that all NIS Power Range A channel drawers are within ± 2% of the calculated calorimetric power.

N-41	(XI-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 ☐

____

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

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

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

CAUTIONS

1) LCV-6-105A and/or 105B may be throttling open due to condensate system pressure being higher than #3 HDT pump discharge pressure.

2) Turbine runback will occur if #3 HDT pump flow to the condensate system drops below 5500 gpm (for greater than 10 seconds), condensate bypass valve LCV-6-105A or 105B opens, and turbine load is above 81% (Unit 1) or 82% (Unit 2).

[51] **PRIOR** to increasing turbine load above 77%:

ENSURE the following:

[51.1] LCV-6-106A and -106B are controlling properly. ________

[51.2] LCV-6-105A and -105B are **CLOSED.** ________

NOTES

1) Ramp load rate increases shall be within the limits of TI-40

2) Intermediate Power Threshold ramp rate target value of 2% / hr may apply.

[52] **RECORD** power ascension ramp rate from TI-40. ________ ☐

NOTES

1) Operation above 75% Load with only two Hotwell Pumps in service requires further evaluation.

2) Steps 5.1[53] through 5.1[56] may be performed out of sequence.

[53] **CONTINUE** the power ascension to 90% reactor power. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[54] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

NOTE

Guidance on restoration of EHC Controls after a BOP runback via the valve position limiter is contained in Appendix B, *Turbine Runback Restoration.* [C.4]

[55] **MONITOR** the turbine load increasing and

MAINTAIN valve position limit approximately 10% above the current governor control indication as turbine load is changed. ☐

NOTE

When the turbine impulse pressure relay number is illuminated on Panel L-262, the relay is closed and Runback circuit is armed.

[56] **WHEN** greater than 77% Turbine Load, **THEN**

VERIFY **[PIS-47-13RLY1]** light **[1]**,'Turbine Runback From Loss of 1 MFP' is illuminated on Panel L-262. ________

[57] **WHEN** greater than 82% Turbine Load, **THEN**

VERIFY the following relay lights are illuminated on Panel L-262:

[57.1] **[PIS-47-13RLY2]**, Turbine Runback From #3HDT.**[2]** ☐

[57.2] **[PIS-47-13RLY 3]**, NPSH Protection VLV-6-106B closes on #3 HDT pump trip. **[3]** ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Reactor power can be increased greater than 90% as long as adequate MFP suction is maintained.

2) Steps 5.1[58] through 5.1[62] may be performed out of sequence.

[58] **WHEN** approximately 85 to 90% reactor power

OR when determined by Unit SRO (if power raised above 90%), **THEN**

ENSURE third condensate booster pump in service in accordance with 1,2-SO-2/3-1. [C.2] __________

NOTE

A nominal CBP suction pressure of approximately 180 psig, as indicated on **[PI-2-77]**, will alleviate bypassing to the condenser at full power.

[59] **IF** condensate pressure is high resulting in #3 or #7 heater drain tank bypassing to the condenser, **OR** the normal level control valves are near full open, **THEN**

[59.1] **THROTTLE [14-550]** to attain desired condensate pressure. __________

[59.2] **IF** unable to throttle **[14-550]**, **THEN**

REFER to 1,2-SO-5-2, Section 8.0 to adjust condensate pressure. __________

OR

EVALUATE removal of the condensate demineralizer booster pumps (N/A if NOT in service). ☐

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Two Cond DI Booster pumps must be started at the same time.

[60] **EVALUATE** starting available condensate demineralizer booster pump(s) to raise system pressure ~ 40 psig.

Pump Started YES ☐ NO ☐ ________

[61] **WHEN** reactor power is approximately 90%,
THEN

PERFORM the following:

[61.1] **ADJUST** Power Range instrumentation in accordance with 0-SI-OPS-092-078.0. ☐

[61.2] **INITIATE** performance of 1-PI-OPS-000-020.1 or 2-PI-OPS-000-022.1, Appendix B. ☐

CAUTION

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

[61.3] **ENSURE** the following level controllers are maintaining levels within normal ranges:

A. Secondary plant heaters. ________

B. MSR drain tanks. ________

CAUTION

DO NOT exceed an average of 3455.0 MWT during an 8-hour period. [C.1]

[62] **MONITOR** NIS, ΔT and calorimetrics on plant computer (pt. U2118) while increasing reactor power. ☐

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Feedwater venturi unfouling may impact U1118 indication. LEFM calorimetric power (U2118) is not affected by venturi unfouling.
2) If U1118 is being used to monitor reactor power due to LEFM unavailable, then Calorimetric Calculation should be performed prior to exceeding 97% reactor power.
3) Steps 5.1[63] through 5.1[67] may be performed out of sequence.

[63] **IF** Unit is returning to full power after a turbine load reduction to less than 50%

AND U1118 is being used to monitor power,
THEN

PERFORM the following prior to exceeding 97% power:

[63.1] **NOTIFY** Systems Engineering to perform 0-PI-SXX-000-022.2, Calorimetric Calculation, Section 8.1, if necessary. ☐

[63.2] **PERFORM** applicable sections of 0-PI-SXX-000-022.2 to adjust Feedwater Flow Constant. (N/A if NOT required)

____
BOP Eng

NOTES

1) Ramp load rate increases shall be within the limits of TI-40
2) Intermediate Power Threshold ramp rate target value of 2% / hr may apply.

[64] **RECORD** power ascension ramp rate from TI-40. ________ ☐

[65] **CONTINUE** power ascension to 100% RTP. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[66] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

NOTE

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

[67] **MONITOR** the turbine load increasing **AND**

MAINTAIN valve position limit approximately 10% above the current governor control indication as turbine load is changed. ☐

NOTE

Steps 5.1[68] through 5.1[71] may be performed out of sequence.

[68] **WHEN** reactor power approaches 100%, **THEN**

ADJUST governor valve position limiter ~ 2% above governor valve position. ☐

NOTE

Engineering recommends placing the 3rd Condensate Demineralizer Booster Pump in service when at full power. Operation of only 2 Condensate Demineralizer Booster Pumps is allowed but reduces the operating margin in the event of a condensate transient based on the lower suction pressure to the MFPs.

[69] **IF** it is desired to place the 3rd condensate demineralizer booster pump in service, **THEN**
START 3rd condensate demineralizer booster pump in accordance with 1,2-SO-2/3-1. _________

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Governor valve position limit meter may NOT match the governor valve position meter; therefore, monitor the megawatt meter and valve position limit light continuously during the following step.

NOTES

1) Operation with the VALVE POS LIMIT light LIT is acceptable if unsatisfactory load swings are experienced.

2) Actions effecting reactivity are directed in the following step. All appropriate verifications and peer checks shall be utilized during performance.

[70] **IF** unsatisfactory load swings are experienced as the unit approaches full power, **THEN**

[70.1] **WITH** turbine load set for maximum of 100% power, **SLOWLY** and **CAUTIOUSLY PULSE** the governor VALVE POSITION LIMIT in LOWER direction while monitoring megawatts for a decrease and VALVE POS LIMIT light to ILLUMINATE. ☐

[70.2] **WHEN** the limiter just reaches the governor valve position,
THEN

STOP limiter adjustment. ☐

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Do not raise the limiter position unless the turbine control is positively controlling the turbine (limit light NOT LIT).

NOTE

Actions effecting reactivity are directed in the following step. All appropriate verifications and peer checks shall be utilized during performance.

[71] **PERFORM** the following if the limiter prevents reactor operation at approximately 100%:

[71.1] **ADJUST** SETTER/REFERENCE controls to reduce turbine loading until the VALVE POS LIMIT light is NOT LIT. ☐

[71.2] **INCREASE** VALVE POSITION LIMIT to allow a load increase using the SETTER/REFERENCE controls, NOT to exceed 3455.00 MWT. ☐

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Full power operation is defined as 100% power operation at approximately 3455 MW_T instantaneous value, U2118 not to exceed 3455.00 MW_T average thermal power in an 8-hour period. [C.1]

2) Do not intentionally operate the reactor at greater than 100% power (e.g., if reactor power is less than 100% for any time period then operation at slightly greater than 100% to "make up" for "lost" power is not permissible). [C.1]

3) Computer point U2118 should be trended on a trend recorder in the unit horseshoe and monitored for increasing reactor power trends above 3455 MW_T. Prompt action shall be taken to decrease reactor power whenever an increasing power trend is observed. [C.1]

4) Do not exceed an 8-hour average value (U2126) of 3455.00 MW_T. Do not allow U2125 (one hour avg) to exceed 3455.00 MW_T (100%) for more than one hour. [C.1]

5) Portions of step 5.1[73] may be performed in parallel with step5.1[72] if required.

[72] **WHEN** the unit stabilizes at 100% reactor power,
THEN

PERFORM the following: (may be performed in any order)

[72.1] **ADJUST** Governor Valve position, rod height, and/or RCS boron concentration as necessary to establish core thermal power at desired value and Auctioneered Hi T-avg approximately equal to T-ref. ☐

[72.2] **NOTIFY** load coordinator that the power increase is complete. ☐

[72.3] **NOTIFY** Radiation Protection that power has stabilized at 100%. ☐

(step continued on next page)

NOTE

Use of seal steam spillover bypass FCV-47-191 should be minimized to reduce the effect of unit trip on seal steam pressure.

[72.4] **IF** Seal Steam spillover bypass [FCV-47-191] is IN SERVICE, **THEN**

THROTTLE Seal Steam spillover bypass to control [FCV-47-191] as required to control seal steam pressure. ☐

[72.5] **IF** river temperature is less than 45°F, **THEN**

CONSULT Engineering to determine if third CCW pump should be removed from service. ☐

[72.6] **CONTACT** vibration engineer in Predictive Maintenance Group to monitor MFWP vibration. ☐

CAUTION

A bias adjustment in the upward direction (> 50% , Unit 1)(> +0, Unit 2) should NOT be used unless evaluated by Systems Engineering since this could impact a MFPT's maximum speed and the ability to fully load in the event the other MFPT trips.

[72.7] **IF** feed pump vibration is above desired levels,
THEN
CONSULT with vibration engineer and system engineer to determine which feed pump to bias to reduce vibration. ☐

[72.8] **IF** MFPT master controller output is NOT indicating 45% to 55%
THEN
CONSULT with MFPT controls system engineer to evaluate if adjustment is required per 1,2-SO-2/3-1. ☐

5.1 Power Ascension From 30% to 100% (continued)

[72.9] **IF** start up on Unit 2,
THEN
DETERMINE if CBP seal backpressure requires adjustment:

[72.9.1] **NOTIFY** Systems Engineering (BOP) to evaluate if adjustments are required on back pressure control valve 2-VLV-54-689. ☐

[72.9.2] **IF** System Engineer determines adjustment of 2-VLV-54-689 is needed,
THEN
ADJUST **[2-VLV-54-689]** as required to establish desired backpressure. ________

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

[73] **IF** startup is following refueling activities, **THEN**

ENSURE the following are performed at approximately 100% Rated Thermal Power: (may be performed in any order)

[73.1] 0-PI-SXX-000-022.2, Calorimetric Calculation.

____
Systems Eng.

[73.2] 0-PI-SXX-000-022.1, Delta T and Tavg Update. [C.7]

____
Systems Eng.

[73.3] 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

__________ __________
Rx Eng Date

[73.4] 0-SI-NUC-000-120.0, Reactivity Balance.

__________ __________
Rx Eng Date

[73.5] 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

__________ __________
Rx Eng Date

[73.6] 0-PI-NUC-092-036.0, Incore-Excore Detector Calibration.

__________ __________
Rx Eng Date

[73.7] 0-PI-IXX-092-N45.0, PR NIS Calibration (May be N/A'd if Engineering determines calibration performed at < 75% RTP is adequate.)

____
Inst Maint

[73.8] Applicable portions of 0-RT-NUC-000-001.0 are complete for full power operations.

____
Rx Engr

STARTUP No.__________ **Unit _____** **Date _________**

5.1 Power Ascension From 30% to 100% (continued)

NOTE

This step may be performed out of sequence if required.

[74] **IF** startup is on Unit 1 and Steam Generator WR level recorders were re-scaled to 80% - 90% in 0-GO-2, **THEN**

NOTIFY MIG to re-scale LR-3-43A and LR-3-98A, Steam Generator Wide Range Level Recorders, to 0% - 100%. __________

[75] **IF** unit shutdown to minimum load, **THEN**

GO TO Section 5.3. __________

[76] **IF** unit is to be maintained at normal power, **THEN**

GO TO Section 5.2. __________

END OF TEXT

Facility: Sequoyah Scenario No.: 7 Op Test No.: 2010302

Examiners: ____________ Operators: ____________

____________ ____________

____________ ____________

Initial Conditions: ~42% Power BOL Start 2nd Main Feedwater Pump, Continue Power Escalation

Turbine Driven Auxiliary Feedwater Pump OOS for maintenance

Turnover: Continue plant startup. Currently at 0-GO-5 Section 5.1, Step 23

Target CTs: Insert Negative reactivity using control rods or boration prior to completion of FR-S.1

Isolate AFW flow to the Faulted SG (#3 SG) by stopping AFW flow within 10 minutes of E-0 entry from FR-S.1

Event No.	Malf. No.	Event Type*	Event Description
1. T+0	N/A	R – RO N – SRO/BOP	~42% Start 2nd MFP, Continue Power Escalation
2. T+20	CN02B	C – BOP	1B Condensate Booster Pump trip
3. T+30	RX06A	I – RO TS – SRO	Pzr Level Controlling Channel LT 68-339 fails low
3.a T+30	N/A	N – BOP	Restore Letdown following Pzr Level Ch failure.
4. T+40	RX15D	TS – SRO	#4 SG Narrow Range Level Transmitter LT 3-106 fails low.
5. T+45	RX24	I – BOP	Feedwater Header PT-3-1 Fails Low
6. T+55	MS06C	C – RO N – Crew	Small Steam Leak Outside Containment Upstream Of Loop #3 MSIV
7. T+65	RP01C [pre-insert]	C – RO	ATWS- Both RTBs fail to automatically or manually open from MCR
8. T+65	RD09	C – RO	Control Rods fail to move in Automatic- delayed
9. T+65	MS06C	M – All	Steam Leak increases to MSLB requiring Reactor Trip/Safety Injection
10. T+65	FW04C	C – BOP	Loop #3 MDAFW LCV Fails Full Open

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

Scenario 7 Summary

The crew will assume the shift with the unit in MODE 1, ~42% RTP with direction to continue plant startup from 0-GO-5 Section 5.1 Step 23 and place the 2nd Main Feedwater Pump in service according to 1-SO-2/3-1 Section 5.16.4 Step 8; then continue plant startup.

When the 2nd Main Feedwater Pump is in service and after the RO raises power, at Lead Examiner direction, 1B Condensate Booster Pump trip will occur. The crew will respond using alarm response procedures, (ARPs) 1-AR-M1-B E-3 and enter AOP-S.04, Condensate or Heater Drains Malfunction Section 2.5. The SRO should direct the application of 0-GO-5, Normal Power Operations Section 5.1 Step 17 to start the available CBP, assuring secondary condensate flow/MFP suction pressure adequacy.

At Lead Examiner direction, the controlling pressurizer level channel LT 68-339 will fail low resulting in letdown isolation and Pzr heaters de-energized. The crew will respond using ARPs 1-AR-M5-A C-3, E-3 and AOP-I.04, Pressurizer Instrument and Control Malfunctions Section 2.4. SRO will refer to Technical Specifications 3.3.1.1 Table 3.3-1 functional unit 11 Action 6; TS 3.3.3.7 Table 3.3-10 Functional Units 7 Action 2.

Following restoration of letdown, at Lead Examiner direction, a Steam Generator #4 narrow range level transmitter LT-3-106 will fail low. No plant transient will result due to the median selector circuit. The crew will respond using ARPs 1-AR-M3-C D-2 and 1-AR-M5-A B-7 and AOP-I.06 Section 2.2. SRO will refer to Technical Specifications 3.3.1.1 Table 3.3-1 Functional Unit 14.A & B, Action 9; 3.3.2.1 Table 3.3-3 Functional Unit(s) 5a- Action 17; 6.c.i.a & 6.c.ii.a & b- Action 36, 8.c- Action 22c.

At Lead Examiner direction, Feedwater header pressure transmitter PT-3-1 will fail low resulting in MFP speed increase to attempt to restore steam header to feedwater differential pressure to program. The crew will respond using ARPs 1-AR-M3-C C-1 and 1-AR-M5-A B-7, AOP-S.01 Section 2.3 is implemented, which directs manual MFP speed control. MFP speed control will remain in manual for the remainder of the scenario.

When plant is stable, at Lead Examiner direction, a small unisolable steam leak will occur on Steam Generator Loop 3 outside containment upstream of the Main Steam Isolation Valve. After identifying increasing reactor power with decreasing main generator megawatts, the crew will enter AOP-S.05, Steam or Feedwater Leak to stabilize the plant and monitor key parameters for Reactor Trip. The crew may attempt to manually trip the reactor based on Reactor/ Turbine power mismatch; if so, initiate the Main Steam Line Break (MSLB) once the reactor trip breakers are open.

When the small steam leak has been addressed, at Lead Examiner direction, the steam leak will be increased to a significant MSLB requiring Reactor Trip and Safety injection. When manual reactor trip is actuated, both reactor trip breakers will fail to open automatically and manually from the MCR resulting in an ATWS and entry into contingency procedure FR-S.1.

During response to the ATWS, control rods will initially insert in automatic but stop after ~10 seconds requiring manual rod insertion. When the Reactor is shutdown and Safety Injection occurred if required, the auxiliary feedwater supply valve to the faulted S/G will fail full open requiring that the associated AFW pump be stopped to stop feed flow to the faulted S/G. Local isolation of the failed AFW valve may also initiated.

E- Procedure Path: E-0 – FR-S.1 – E-0 – E-2

The scenario may be terminated when crew meets transition criteria to E-2.

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
Simulator IC	**IC-118** 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:** **1009 NRC ESG-7** Place simulator in RUN. Place OOS equipment in required position with tags. Clear alarms	**42%, BOL ~150 MWD/MTU** **CB 'D' Rods @ 180 steps, all others @ 228 steps;** **[B] = 1350 ppm; Ba Blender setting: 28%** **Xe/Sm @ *equilibrium*** ***Console Operator actions: Place simulator in run and perform the following:*** - **Set Ranges on Tave/Tref Recorder on 1-M-6 to ± 3 degrees for current conditions** *(System Menu/Strip Chart Assign… Tab through to fix)* - **Place the MODE 1 sign on 1-M-4** - **Place Train Week A sign** - **Place 1C Pzr Htrs I/S**
MFs, RFs, ORs are active when the SCN file is loaded.	IMF FW07C f:1 IOR ZLOHS151A_GREEN f:0 IOR ZLOHS117A_GREEN f:0 IOR ZLOHS118A_GREEN f:0 IOR ZLOHS3136AA_GREEN1 f:0 IOR ZLOHS3136AA_GREEN2 f:0 IOR ZLOHS3136AA_RED1 f:0 IOR ZLOHS3136AA_RED2 f:0 IOR ZDIHS3136AA f:0 IOR ZLOHS3179AA_GREEN1 f:0 IOR ZLOHS3179AA_GREEN2 f:0 IOR ZLOHS3179AA_RED1 f:0 IOR ZLOHS3179AA_RED2 f:0 IOR ZDIHS3179AA f:0	**TDAFW Pump Is Inoperable.** ***Close FCV-1-17 & 18 & place Hold Notice on HS-1-17&18 and FCV-1-51.*** ***Also place Hold order on TDAFW Pump ERCW supply valves.*** ***Place Protected Equipment Tags on 1-M-4, MD AFW Pumps and 0-M-26, both EDGs***
1.	**- none -** **IRF FWR10A f:3360 r:30 k:1** **IRF FWR10B f:3700 r:30 k:11**	~42% Power, Start 2nd Main Feedwater Pump, Continue Plant Startup. *Support staff report:* *Simulates I&C local speed changer adjustments as requested by MCR crew (vary 'f' value to obtain requested rpm on 1-M-3).*
2.	**IMF CN02B f:1 k:2**	**1B Condensate Booster Pump trip** *Support staff report: When AUO dispatched, wait ~3 minutes and report timed overcurrent relay target is actuated.*
3.	**IMF RX06A f:1 k:3**	**Controlling Pzr Lvl Transmitter fails lo (LT 68-339)** *Support staff report: When MSS contacted, report that I&C will report to the MCR in ~ 25 minutes.*

EVENT	IC/MF/RF/OR #	DESCRIPTION/EXPECTED ACTIONS/BOOTH FEEDBACK
4.	**IMF RX15D f:0 k:4**	**#4 SG Lvl Transmitter fails Lo (LT 3-106)** *Support staff report:* *When MSS contacted, report that I&C will report to the MCR in ~ 45 minutes.*
5.	**IMF RX24 f:1 r:30 k:5**	**FW Header Pressure Transmitter fails lo (PT-3-1)** *Support staff report:* *When AUO dispatched, wait ~3 minutes and report no apparent local problems.*
6.	**IMF MS06C f:29 r:15 k:6**	**MS Leak Outside Containment - LP #3 upstream of MSIV** *Support staff report:* *When AUO dispatched, wait ~2 minutes, report steam coming from the East Valve Vault Room; No personnel safety issues observable.*
Instructor Note: If Crew elects to manually trip for the small steam leak, MMF to the values below once the RTBs are open.		
7.	**IMF RP01C f:1** **[Pre-insert]**	**ATWS- both Rx Trip Breakers Auto/Manual fail** *Support staff report:* *below*
8.	**IMF RD09 f:1 d:10 e:7**	**Rods move in AUTO for 10 seconds following MT Manual Trip then Auto movement stops.** *Support staff report:* *none*
	IRF RPR05A f:1 d:180 k:18 **IRF RPR05B f:1 d:185 k:18**	**Opens Rx Trip Bkrs in sequence** *Support staff report:* *When AUO dispatched, wait 3 min 5 sec, report both Rx Trip Bkrs opened locally.*
9.	**MMF MS06C f:75 r:300**	**Increase MS Leak Outside Containment - LP #3 upstream of MSIV requiring Rx Trip & SI** *Support staff report:* *If previously dispatched, when contacted report leak much worse;* *If dispatched to look for steam/feedwater leaks, wait ~3 minutes, report steam coming from the East Valve Vault Room*
10.	**IMF FW04C f:1 e:1**	**#3 MDAFW Main LCV-3-148 fails open** *Support staff report:* *When AUO dispatched, wait ~3 minutes, report the valve is full open; no apparent cause.*
	IRF FWR05 f:0 k:20	**MDAFW #3 LCV Isolation Valve 1-VLV-3-826** (Isolates Main and Bypass valves) *Support staff report:* *When AUO dispatched, wait ~ 5 minutes, report 3-826 is closed*
Termination Criteria: When Crew meets transition criteria to E-2		

DELTA TIME (hrs)	REACTOF POWER (%)	POWER DEFECT (pcm)	ASSUMED ROD HT (steps)	INSERTED WORTH (pcm)	EXPECTEI XENON (pcm)	DELTA RHC BORON (pcm)	BORON CONC (ppm)	DELTA PPM (ppm)	ECOMMENI DILUTION (gal)	RECOMMENI BORATION (gal)	IODINE CONC (% eq)
0	42.0	740.7	180.0	-315.7	-2020.0	---	1350.0	---	---	---	42.0
1	50.0	865.5	190.0	-230.5	-1995.3	14.9	1347.6	-2.4	113	0	42.4
2	54.5	934.4	193.0	-203.5	-1960.4	7.0	1346.5	-1.1	53	0	43.4
3	59.0	1003.6	196.0	-177.3	-1925.0	7.6	1345.3	-1.2	58	0	44.7
4	63.5	1072.5	199.0	-152.2	-1891.8	10.5	1343.6	-1.7	80	0	46.3
5	68.0	1141.8	202.0	-128.1	-1862.4	15.8	1341.1	-2.5	121	0	48.2
6	72.5	1211.5	205.0	-105.0	-1838.4	22.6	1337.5	-3.6	173	0	50.4
7	75.0	1251.0	208.0	-84.1	-1822.9	3.1	1337.0	-0.5	24	0	52.7
8	75.0	1251.1	211.0	-64.7	-1820.5	-21.7	1340.5	3.4	0	40	54.9
9	75.0	1250.0	214.0	-47.2	-1830.6	-8.5	1341.8	1.4	0	16	56.9
10	75.0	1249.6	216.0	-36.1	-1849.8	7.6	1340.6	-1.2	58	0	58.7
11	75.0	1250.0	216.0	-36.0	-1875.1	25.7	1336.5	-4.1	197	0	60.3
12	75.0	1251.3	216.0	-36.0	-1904.5	30.7	1331.7	-4.9	236	0	61.7
13	75.0	1252.9	216.0	-36.0	-1936.3	33.3	1326.4	-5.3	257	0	63.0
14	75.0	1254.6	216.0	-35.9	-1969.2	34.6	1320.9	-5.5	268	0	64.2
15	75.0	1256.3	216.0	-35.9	-2002.3	34.8	1315.4	-5.5	271	0	65.3
16	75.0	1258.1	216.0	-35.8	-2035.0	34.4	1309.9	-5.5	268	0	66.2
17	75.0	1259.8	216.0	-35.8	-2066.7	33.4	1304.6	-5.3	262	0	67.1
18	75.0	1261.5	216.0	-35.8	-2097.1	32.1	1299.5	-5.1	252	0	67.9
19	75.0	1263.2	216.0	-35.7	-2126.0	30.5	1294.7	-4.8	241	0	68.6
20	75.0	1264.8	216.0	-35.7	-2153.2	28.8	1290.1	-4.6	228	0	69.2

150	MWD/MTU
6820	BAT ppm

Hold Tavg = Tref +/- 1.5F

Total 3160 56

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

Reason for Maneuver: Reactor/Plant restart following forced outage- 50% hold 75% hold

Date: Today

RxEng Name: J. Sidekick

Comments: none

Unit 1 MCR CHECKLIST Page 1. of 3 Today

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

Mode 1, 42% Power **PSA Risk: YELLOW** **Grid Risk: Green** **RCS Leakage ID .02 gpm, UNID .02 gpm**	**NRC phone Authentication Code** **Until 0800 XXXX** **After 0800 YYYY**

Common Tech Spec Actions

- **None**

U-1 Tech Spec Actions

LCO/TRM	Equipment INOP	Time INOP	Owner
TS LCO 3.7.1.2.a	TDAFW T&T valve repair	2 hours ago	MMG
TS 3.3.3.7.18b action 1	TDAFWP ERCW - AFW Valve Position	2 hours ago	MMG

Protected Equipment

- Equipment/spaces for TDAFW Pump per 0-GO-16 Appx J

Shift Priorities

- Place the 2nd Main Feedwater Pump in service according to 1-SO-2/3-1 Section 5.16.4, *Startup of Second MFPT. Section 5.16.4* is in progress and complete through step 7. AUO, MIG, and PDM, support are present at the 1-B MFPT as needed.
- Plant Startup held at ~42% awaiting availability of MFP B for past 72 hrs. Currently in 0-GO-5 Section 5.1, Step 23. Continue plant startup per Rx Engineering Spreadsheet. Spreadsheet has been verified by the SRO/STA. 1-SO-62-7 Appendix D and E have been completed. Pre-conditioned Power level is 100%.

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

SHIFT TURNOVER CHECKLIST

Page 2. of 3

Today

MAIN CONTROL ROOM (7690)

- **Train _B_ Week**
- Protected Equipment:
    - MDAFW Pump A 1-HS-3-118A
    - MDAFW Pump B 1-HS-3-128A
    - D/G 1A-A 1-HS-57-46A
    - D/G 1B-B 1-HS-57-73A

OUTSIDE (7666) [593-5214]

- ***All Equipment normal for current conditions***
- ***Equipment/spaces for TDAFWP protected per 0-GO-16 Appx J***

AUXILIARY BUILDING (7775)

- ***TDAFW pump was tagged 2 hours ago for repair to the T&T valve. The packing was blowing excessively. Expected Return to service is 8 hours. (WO 10-080025-000)***

TURBINE BUILDING (7771) (593-8455)

- ***All Equipment normal for current conditions***

SHIFT TURNOVER CHECKLIST

Page 3. of 3

Today

Disabled Annunciators

PANEL	WINDOW	ANNUNCIATOR	WO / PER Number

Equipment Off-Normal (Pink Tags)

UNID And Noun Name	Panel	Problem Description	WO / PER Number

MCR WO LIST

ID And Noun Name	Panel	Problem Description	WO/PER Number

UNIT ONE REACTIVITY BRIEF

Date: Today Time: Now

General Information

RCS Boron: **1350** ppm Today	BA Controller Setpoint: **28%** *		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 189: **17** gallons of acid, **75** 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: **22**	Gallons of water: **94**	Rod Steps: **1**

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%	181 Steps on bank D	93 gallons
30%	161 Steps on bank D	291 gallons
50%	n/a	n/a

** 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 TODAY. Data Valid through three weeks from now.

Previous Shift Reactivity Manipulations

Number of dilutions: 1	Number of borations:	Rod steps in:
Gallons per dilution: 12	Gallons per boration:	Rod steps out:
Total amount diluted: 12	Total amount borated:	Net change: IN/Out

Current Shift Estimated Reactivity Manipulations

Remarks: Rx Power – 42% MWD/MTU – 150 Xenon & Samarium at Equilibrium

***** As Required by Reactor Engineering startup spreadsheet.**

***The boron letdown curve is flat for the next 25 EFPD.

Last Dilution Complete ~1 hour ago.

Next Unit 1 Flux Map is scheduled: N/A

Unit Supervisor: ______________________

Name/Date

Operations Chemistry Information

Boron Results

Sample Point	Units	Boron	Date / Time	Goal	Limit
U1 RCS	ppm	1350	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	ppm	1.1	Today / Now	>1	>1
U2 RCS	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	115	Today / Now	68	Today / Now
15 gpd (30 min increase)	cpm	265	Today / Now	83	Today / Now
30 gpd leak equivalent	cpm	490	Today / Now	206	Today / Now
75 gpd leak equivalent	cpm	1165	Today / Now	455	Today / Now
150 gpd leak equivalent	cpm	2290	Today / Now	870	Today / Now
CVE Air Inleakage	cfm	10	Today / Now	12.5	Today / Now
Bkgd on 99/119	cfm	40	Today / Now	40	Today / Now

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

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 1 of 44

Event Description: ~42% Start 2nd MFP, Continue Power Escalation

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or behavior</th></tr>
<tr><td colspan="3">Simulator Operator: No action required for Event 1</td></tr>
<tr><td colspan="3">Indications available: None, Crew will perform startup IAW 0-GO-5 Section 5.1, Step 23.</td></tr>
<tr><td>T = 0</td><td colspan="2">Following completion of crew turnover, at the SRO's direction, the BOP will place the 1B MFP in service Section 5.1 Power Ascension From 30% to 100% Step 23 in preparation for continuing plant power escalation .</td></tr>
<tr><td></td><td>SRO</td><td>Direct load increase from ~42% power in accordance with 0-GO-5, <i>Normal Power Operation,</i> beginning in Section 5.1, at Step 23.</td></tr>
<tr><td></td><td colspan="2">NOTE: 1) With verbal approval from the Operations Superintendent, placing the second main feed pump in service may be deferred until power is approximately 55% (Unit 1) or 65% (Unit 2). Logic prevents opening the standby MFPT condenser isolation valves if the pump is NOT reset prior to exceeding 9 million lbs/hr flow on the running pump.

2) LCO 3.3.2.1 (3.3.2) functional unit 6.f (AFW start function for the trip of both MFPT) allows one channel to be inoperable in Mode 1 for up to 4 hours when starting up or shutting down the second MFPT.</td></tr>
<tr><td></td><td>SRO</td><td>[23] WHEN approximately 40% turbine load:</td></tr>
<tr><td></td><td>BOP/
SRO</td><td>[23.1] VERIFY annunciator XA-55-4A, window E-7 is LIT:

C-20 AMSAC
ARMED</td></tr>
<tr><td></td><td>BOP</td><td>[23.2] CLOSE the drains on the operating main feedwater pump turbine (N/A other pump).
<table>
<tr><th>MFPT</th><th>DESCRIPTION</th><th>HANDSWITCH</th></tr>
<tr><td>A</td><td>DRAIN VALVES</td><td>HS-46-14</td></tr>
<tr><td>B</td><td>DRAIN VALVES</td><td>HS-46-41</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO</td><td>[24] WHEN approximately 40 to 45% turbine load, THEN PLACE second MFPT in service by performing the following:</td></tr>
<tr><td></td><td>SRO</td><td>[24.1] IF the Operations Superintendent has approved… N/A</td></tr>
<tr><td></td><td>SRO/
BOP</td><td>[24.2] WHEN second MFPT is to be placed in service, THEN

PLACE second MFPT in service in accordance with 1,2-SO-2/3-1.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 2 of 44

Event Description: ~42% Start 2nd MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
Evaluator Note: The following steps are from 1-SO-2/3-1 Section 5.16.4 beginning at step 8. The preceding steps of the SO were previously performed and snapped into the Scenario Initial Conditions.		
		[8] **PERFORM** the following:
		[a] **ENUSRE [1-HCV-3-70]**, Main FW Pump 1A Bypass… N/A
		[b] **ENUSRE [1-HCV-3-84]]**, Main FW Pump 1B Bypass Warm-up Valve **CLOSED**.
		[c] **IF** starting 1A MFP… N/A
		[d] **IF** starting 1B MFP, **THEN THROTTLE [1-FCV-3-84]** MFP Recirc valve between 30%-50% OPEN **USING [1-FIC-3-84]**.
	NOTE: The AFW start function on loss of both MFW pumps is inoperable when a MFW pump is RESET but NOT pumping forward. LCO 3.3.2.1 allows the AFW start to be inoperable for up to 4 hours when starting up the second MFW pump.	
		[9] **RESET** the Standby MFPT.
		[10] **ENSURE** the following:

MFPT	DESCRIPTION	VALVE	POSITION
1A	Condenser Inlet Isol valve	1-FCV-2-205A	OPEN
	Condenser Outlet Isol valve	1-FCV-2-210A	OPEN
1B	Condenser Inlet Isol valve	1-FCV-2-211A	OPEN
	Condenser Outlet Isol valve	1-FCV-2-216A	OPEN

Time	Position	Applicant's Actions or behavior
	NOTE: Either stop valve handswitch will open both high pressure and low pressure stop valves for the applicable MFPT.	
		[11] **OPEN** the Stop Valves for the MFPT to be started by placing either the H/P **or** L/P handswitch to the **RAISE** position:

MFPT	DESCRIPTION	HANDSWITCH	VALVE POSITION
1A	H/P Stop Valve	1-HS-46-15A	OPEN
	L/P Stop Valve	1-HS-46-16A	OPEN
1B	H/P Stop Valve	1-HS-46-43A	OPEN
	L/P Stop Valve	1-HS-46-44A	OPEN

Time	Position	Applicant's Actions or behavior
	BOP	[12] **VERIFY** the MFP turning gear motor has STOPPED. **(as indicated on 1-M-3, Turning Gear MFPT B handswitch,1-HS-46-38A)**

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 3 of 44

Event Description: ~42% Start 2nd MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
	CAUTION: Observe MFP speed, flow, discharge pressure during the MPFT startup to prevent an inadvertent FW swing if the MFPT minimum speed setpoint is excessively high.	
	NOTE: The feedwater pump speed controller will take control at the minimum speed setting and run the governor valve positioner out to its upper limit. Minimum speed on high pressure steam is 3100 to 3,300 rpm and 3650 to 3850 rpm on low pressure steam. This value may vary based on previous hand speed changer adjustment.	
	CREW	**[13] NOTIFY** I&C to adjust the MFPT hand changer for the proper rpm as the second MFPT is accelerated.
	NOTE 1: Vibration and thrust bearing wear should be monitored on local Bently Nevada panel and ICS (Secondary Mimics, MFP Bearing Data). Max allowable vibration (danger limit) is 5 mils above baseline; alert value is 3 mils above baseline. Thrust bearing wear trip setpoint is 10 mils above baseline (7 mils alert above baseline). **NOTE 2:** 1A MFWP condenser vacuum may be monitored using 1-PI-2-331A (TB el. 685), ICS computer point 1U2082, or by monitoring condenser drain temperature (ICS point 1T2360A). 1B MFWP condenser vacuum may be monitored using, 1-PI-2-331B (TB el. 685), ICS computer point 1U2084, or by monitoring condenser drain temperature (ICS point 1T2361A). Drain temp ≤160°F indicates vacuum of at least 20" Hg. MFWP trip setpoint of 12.2 psia corresponds to ~5 "Hg vacuum or drain temp of ~200°F. **NOTE 3:** Max allowable bearing temperature is 225°F.	
	BOP	**[14] MONITOR** the following parameters during MFWP startup:
		• Vibration and thrust bearing wear (at local panel). • MFWP Condenser vacuum/drain temperature. • Oil system and bearing temperatures.
	BOP	**[15] OPEN** Governor Valve by **PERFORMING** one of the following:
		[a] IF MCR operation of Governor Valve Positioner is available, **THEN PLACE** the applicable Governor Valve Positioner to the **RAISE** position to open the steam chest valves and accelerate the MFPT: 1B GV Positioner→1-HS-46-40A →OPEN
	BOP	**[b] IF** MCR operation of Governor Valve Positioner is unavailable, **THEN:**

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Event Description: ~42% Start 2nd MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
		1. **ESTABLISH** direct communications between the personnel operating the U1 MFP speed control locally and the U1 Main Control Room.
		2. **DIRECT** I&C to slowly adjust U1 MFP Speed Control using local manual control of the MFP Governor Valve Positioner to throttle steam chest valves and control MFPT speed.
	CAUTION:	**DO NOT increase second MFPT speed faster than the master speed control can maintain program d/p.**
	NOTE:	As the second MFPT is loaded, the first MFPT should back down in load.
		[16] **SLOWLY LOAD** the second MFPT to raise MFPT speed until demand on MFPT speed controller matches the demand output of the first MFPT.
		[17] **ENSURE** MFP Injection Water Intermediate Leakoff Pressure for **BOTH** MFPs is approximately 200-250 psig. [a] **[1-PI-54-2],** 1A MFP ________________ **AND** [b] **[1-PI-54-6]**, 1B MFP ________________
		[18] **ENSURE** MFP Injection Water Differential Pressure for pump started is equal to or greater than 25 psid. [a] **[1-PDI-54-1]**, 1A MFP ______________ **OR** [b] **[1-PDI-54-5]**, 1B MFP ______________
		[19] **WHEN** the output meter for the SIC for the second MFPT matches the output meter on the Master Controller, **THEN PLACE** the second MFPT SIC in **AUTO**.

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 5 of 44

Event Description: ~42% Start 2nd MFP, Continue Power Escalation

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or behavior</th></tr>
<tr><td></td><td></td><td>[20] CLOSE the second MFPT drain valves (N/A valves not closed):
<table>
<tr><th>MFPT</th><th>DESCRIPTION</th><th>HANDSWITCH</th><th>POSITION</th></tr>
<tr><td>1A</td><td>Drain Valves</td><td>1-HS-46-14</td><td>CLOSED</td></tr>
<tr><td>1B</td><td>Drain Valves</td><td>1-HS-46-41</td><td>CLOSED</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">CAUTION 1: MFP Recirc valves controllers should NOT be operated in AUTOMATIC due to the potential for isolating all three intermediate heater strings and resulting MFP damage.</td></tr>
<tr><td></td><td colspan="2">CAUTION 2: Operation of MFP RECIRC valve should be performed slowly due to affect on MFP DP program.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>BOP</td><td>[21] ENSURE [1-FCV-3-70] or [1-FCV-3-84] MFP Recirc valve is CLOSED and in MANUAL.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">CAUTION: Failure to readjust the minimum speed on the second MFWP could result in the second MFWP being unable to supply adequate feed flow in the event the first MFWP trips.</td></tr>
<tr><td></td><td colspan="2">NOTE: The following step may be performed in parallel with power increase but should be completed prior to exceeding 55% power.</td></tr>
<tr><td></td><td></td><td>[22] WHEN MFWP speed controllers [1-SIC-46-20A] and [1-SIC-46-20B] are in AUTO, THEN PERFORM the following to adjust the minimum speed on the second MFWP:
[a] VERIFY both MFWP speed controller bias settings at 50%.
[b] NOTIFY I&C to slowly adjust the hand speed changer on the second MFWP so that the MFWP speeds are equal.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">CAUTION 1: A bias adjustment in the upward direction (> 50%) should NOT be used unless evaluated by Systems Engineering since this could impact a MFPT's maximum speed and the ability to fully load in the event the other MFPT trips.</td></tr>
<tr><td></td><td colspan="2">CAUTION 2 Transferring a MFPT Controller from Manual to Auto with the bias not set to 50% will result in an instantaneous speed change of the MFPT. Transferring the Master MFPT Controller from Manual to Auto with bias not set to 50% will result in an instantaneous speed change of the MFPT.</td></tr>
<tr><td></td><td colspan="2">NOTE 1 The following step may be performed at any time when both MFPTs are inservice and in AUTO.</td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 6 of 44

Event Description: ~42% Start 2^{nd} MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
	NOTE 2	With both MFPTs in **AUTO** it may become necessary to adjust the MFPT speed control bias on one of the operating MFPTs to prevent MFPTs from fighting each other (oscillating).
		[23] IF an adjustment of the flow balance between the MFPTs is desired, **THEN** **SLOWLY ADJUST** one MFPT speed control bias in downward direction (0% to 50%) until desired flow balance is achieved.
		End of Section 5.16.4

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 7 of 44

Event Description: ~42% Start 2nd MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
		0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute
Evaluator Note:		Dilutions will be performed based on the RE-provided Reactivity Spreadsheet; during subsequent power escalation, large volume dilutions will be divided evenly over each hour as determined by the crew. An extra bank of pressurizer heaters (Back-up Group 1C) will be energized to cause pressurizer spray operation for equalizing boron concentration in RCS and pressurizer.
	RO	**[1] ENSURE** unit is NOT in a Tech Spec or TRM action that prohibits positive reactivity additions. **[C.1]**
	NOTE	HUT level increase of 1% is equal to 1380 gallons (TI-28 fig. C.21).
	RO	**[2] ENSURE** sufficient capacity available in the HUT selected to receive expected amounts of CVCS letdown: (**N/A** if not used)
		HUT A: LEVEL ________ %, INITIALS ________ HUT B: LEVEL ________ %, INITIALS ________
	RO	**[3] ENSURE** makeup system is aligned for **AUTO** operation in accordance with Section 5.1.
	RO	**[4] RECORD** the quantity of dilution water required to achieve desired boron concentration using Appendix D. (**N/A** for minor power changes) ________ gals
	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.
	RO	**[5] 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)
	RO	**[6] PLACE [HS-62-140A]**, Boric Acid Supply to Blender Flow Control Switch to the **STOP** position.

Event Description: ~42% Start 2^{nd} MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
		0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute
	RO	**[7] PLACE [HS-62-140B]**, CVCS Makeup Selector Switch to the **DILUTE** position.
	RO	**[8] ENSURE [HS-62-140D]**, Boric Acid Valve to the Blender is **CLOSED** (Green light is **LIT**).
	RO	**[9] SET [FQ-62-142]**, Batch Integrator for the desired quantity
	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	**[10] ADJUST [FC-62-142]**, Primary Makeup Water Flow Controller for the desired flow rate
	RO	**[11] 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	**[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]**.
	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	**[13] IF** primary water addition to the bottom of the VCT **[FCV-62-144]** is desired, **THEN**
	RO	**[a] CLOSE [FCV-62-128]** with **[HS-62-128]**.
	RO	**[b] OPEN [FCV-62-144]** with **[HS-62-144]**.

Op Test No.: NRC 2010302 Scenario # 7 Event # 1 Page 9 of 44

Event Description: ~42% Start 2nd MFP, Continue Power Escalation

Time	Position	Applicant's Actions or behavior
0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute		
	RO	[c] **VERIFY** Primary Water flow by [FI-62-142A] **OR** [FQ-62-142].
	NOTE	It may take approximately 15 minutes before any changes to reactivity are indicated on nuclear instrumentation or RCS temperature indication.
		[14] **MONITOR** nuclear instrumentation and reactor coolant temperature to ensure the proper response from dilution.
		[15] **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.
		[16] **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].
		[c] **VERIFY** no primary water flow on either [FI-62-142A] **OR** [FQ-62-142].
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.		
		[17] **IF** power increase in progress and additional dilutions will be required, **THEN** use this table to re-perform steps **[4]** through **[18]** (next page)
		[19] **REALIGN** the blender controls for **AUTO** makeup to the CVCS in accordance with Section 5.1.
		[20] **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.
		[21] **IF** RCS boron sample is required, **THEN NOTIFY** Chem Lab to obtain RCS boron sample.
		End of Section 6.2

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Event Description: ~42% Start 2nd MFP, Continue Power Escalation

Time	**Position**	**Applicant's Actions or behavior**

0-SO-62-7 Boron Concentration Control, Section 6.2 Dilute

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. ______/______ 1st CV

[b] PLACE **[HS-62-140A]**, BA to Blender Flow Control Switch to **START** position. ☐

[c] ENSURE dilution is logged in Unit Narrative Log. ☐

Op Test No.:	NRC 2010302	Scenario #	7	Event #	2	Page	11 of 44
Event Description:	1B Condensate Booster Pump trip						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 2		
Indications/Alarms **Annunciator:** **1-M-1** • **1-XA-55-1B E-3, "MOTOR TRIPOUT PNL 1-M-1 THRU 1-M-6"** **1-M-3** • **1-XA-55-3A A-4, "CONDENSATE BOOSTER PUMP 1A FAIL TO START"** **Indications:** **1-M-3** • **1-EI-2-97, CBP-A AMPS decrease to '0'** • **Indicator 1-PI-2 129 MFP INLET PRESS indicates a lowering pressure** **Significant Resultant Alarms/Indications:** **Annunciator:** **1-M-3** • **1-XA-55-3A E-1, "PS-2-129 LOW NPSH AT MFP'S"**		
T + 20	BOP	Identifies alarm 1-XA-55-3A B-4, "Condensate Booster Pump 1B Fail To Start", acknowledges alarm and, notifies SRO
	BOP	Refers to and implements Condensate Booster Pump alarm response procedure (ARP), Probable Causes: **[1]** Dispatches an AUO locally; **[2] VERIFY** NPSH > 20 psig. **[3] IF** Condensate Boost Pump Tripped, **THEN GO TO** AOP-S.04, Condensate or Heater Drains Malfunction.
	SRO	Directs entry into and implementation of AOP-S.04, Condensate or Heater Drains Malfunction Section 2.5, Condensate Booster Pump Trip
		AOP-S.04, Condensate or Heater Drains Malfunction **Section 2.5, Condensate Booster Pump Trip**
Evaluator Note: Secondary pressures and flows will fluctuate but stabilize; implementation of step 1 RNO below is not necessary; required pressures and flows and will be adequate to maintain operating conditions to reach step 5 RNO to start the standby CBP, 1C.		
	SRO/ BOP	1. **VERIFY** two condensate booster pumps RUNNING. ***(RNO- reference)***
		RNO: **IF** NO condensate booster pumpis running… **N/A**

Op Test No.: NRC 2010302 Scenario # 7 Event # 2 Page 12 of 44

Event Description: 1B Condensate Booster Pump trip

Time	Position	Applicant's Actions or Behavior
		IF one condensate booster pump is running **AND** secondary pump cavitation indicated, **THEN PERFORM** the following: a. **TRIP** reactor. b. **TRIP** MFW pumps. c. **GO TO** E-0, Reactor Trip or Safety Injection.
		2. **MONITOR** Steam generator levels returning to program. [M-4].
		3. **MONITOR** reactor power:
		a. **CHECK** ICS thermal power indication AVAILABLE.
		b. **REDUCE** turbine load as necessary to maintain 10 minute average power less than applicable limit (3455 or 3411 MWt).
		4. **DISPATCH** operator to investigate cause of Condensate Booster Pump trip.

Evaluator Note: SRO, crew should elect to start 1C CBP according to 0-GO-5 Section 5.1, Power Ascension From 30% to 100% Step 25 adhering to step 17 of the same section:
[17] **WHEN** the condensate booster pump reaches approximately 140 amps, **THEN START** the following pumps in accordance with 1,2-SO-2/3-1:
[17.2] Second CBP

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.

NOTE: Severe MFW pump cavitation is likely if inlet pressure is less than 250 psig.

		5. **MONITOR** Feedwater pump inlet pressure greater than 320 psig. [M-3, PI-2-129] ***(RNO required)***
	SRO BOP	**RNO:** **EVALUATE** starting additional available condensate system pumps (Hotwell, Cond. Booster, Cond. DI Booster) **REDUCE** turbine load until… N/A SRO directs the BOP to start 1C CBP

Op Test No.: NRC 2010302 Scenario # 7 Event # 2 Page 13 of 44

Event Description: 1B Condensate Booster Pump trip

Time	Position	Applicant's Actions or Behavior
		6. **MONITOR** Condensate Booster pump suction pressure greater than 100 psig. [M-3, PI-2-77]
		7. **NOTIFY** Maintenance to investigate and repair pump malfunction as necessary.
		8. **CHECK** reactor power greater than 85% ***(RNO required)***
		RNO: **GO TO** Step 10.
		10. **GO TO** appropriate plant procedure.
Evaluator Note:		The following CREW Brief and Notification actions are not contained in the procedure.
		CREW Brief would typically be conducted for this event as time allows prior to the next event.
		Notifications should be addressed as applicable if not specifically addressed by the procedure or in the CREW brief. <u>Operations Management</u> - Typically Shift Manager. <u>Maintenance Personnel</u> – Typically Maintenance Shift Supervisor (MSS). (**Note:** Maintenance notification may be delegated to the Shift Manager).

Lead Examiner may cue next event when 1C CBP is in service.

Op Test No.: NRC 2010302 Scenario # 7 Event # 3 Page 14 of 44

Event Description: Pzr Level Controlling Channel LT 68-339 fails low

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Simulator Operator: When directed, initiate Event 3</td></tr>
<tr><td colspan="3">Indications/Alarms
Annunciator:
1-M-5
• 1-XA-55-5A C-3, “PRESSURIZER LEVEL HIGH-LOW”
• E3, “PRZR LVL LOW HEATER OFF & LETDOWN SECURED”
Indications:
1-M-4
• 1-LI-68-339 RCS PZR LEVEL indicates ‘0’ level
Significant Resultant Alarms/Indications:
1-M-6
• 1-FI-62-82, LETDOWN HX OUTLET FLOW indicates ‘0’ flow
0-M-27
• 0-XA-27B-B A-5, “LETDOWN HX OUTLET FLOW/TEMP ABNORMAL”</td></tr>
<tr><td>T + 30</td><td>RO</td><td>Identifies alarm 1-XA-55-5A C-3, “PRESSURIZER LEVEL HIGH-LOW”, acknowledges alarm and, notifies SRO</td></tr>
<tr><td></td><td>SRO</td><td>Direct entry to AOP-I.04, Pressurizer Instrument Malfunction, Section 2.4 Pressurizer Level Instrument Malfunction</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE: Appendix M shows layout of PZR level control for operator reference</td></tr>
<tr><td></td><td>RO</td><td>1. CHECK LI-68-339 indicates NORMAL
<i>(RNO required)</i></td></tr>
<tr><td></td><td></td><td>RNO:
PERFORM the following:
a. ENSURE LEVEL CONTROL CHANNEL SELECTOR switch XS-68-339E in LT-68-335 & 320.
b. ENSURE LEVEL REC CHANNEL SELECTOR switch XS-68-339B in LT-68-320 or LT-68-335.
c. GO TO Step 4.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO</td><td>4. CHECK letdown IN SERVICE.
<i>(RNO required)</i></td></tr>
<tr><td></td><td></td><td>RNO:
RESTORE letdown USING EA-62-5, Establishing Normal Charging and Letdown.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 7 Event # 3 Page 15 of 44

Event Description: Pzr Level Controlling Channel LT 68-339 fails low

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Evaluator Note: The following steps are from EA-62-5 performed by the RO to reestablish Letdown. SRO may continue in AOP-I.04 with Tech Spec Evaluation etc.</td></tr>
<tr><td></td><td></td><td>4.0 OPERATOR ACTIONS
4.1 Section Applicability
2. IF normal letdown flow is to be established, THEN GO TO Section 4.3.</td></tr>
<tr><td></td><td></td><td>4.3 Establishing Normal Letdown Flow</td></tr>
<tr><td></td><td colspan="2">NOTE EA-62-3, Establishing Excess Letdown, may be utilized if Normal Letdown cannot be established.</td></tr>
<tr><td></td><td>SRO</td><td>1. IF charging flow NOT established, THEN PERFORM Section 4.2.</td></tr>
<tr><td></td><td>RO</td><td>2. VERIFY pressurizer level greater than 17%.</td></tr>
<tr><td></td><td>RO</td><td>3. ENSURE letdown orifice isolation valves CLOSED:
<table>
<tr><th>LETDOWN ORIFICE ISOLATION VALVES</th><th>CLOSED
√</th></tr>
<tr><td>FCV-62-72</td><td>☐</td></tr>
<tr><td>FCV-62-73</td><td>☐</td></tr>
<tr><td>FCV-62-74</td><td>☐</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>4. OPEN letdown isolation valves:
<table>
<tr><th>LETDOWN ISOLATION VALVES</th><th>OPEN
√</th></tr>
<tr><td>FCV-62-69</td><td>☐</td></tr>
<tr><td>FCV-62-70</td><td>☐</td></tr>
<tr><td>FCV-62-77</td><td>☐</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">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.</td></tr>
<tr><td></td><td>RO/BOP</td><td>5. PLACE [HIC-62-78] in MANUAL, AND OPEN [TCV-70-192] to ~50%.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>6. PLACE letdown pressure controller [PCV-62-81] in MANUAL and ADJUST output between 40% and 50%, (50%-60% open).</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO?BOP</td><td>7. ADJUST charging flow as necessary to prevent flashing in the letdown line.</td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 7 Event # 3 Page 16 of 44

Event Description: Pzr Level Controlling Channel LT 68-339 fails low

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td>RO/BOP</td><td>8. OPEN letdown orifice isolation valves as needed:
<table>
<tr><th>LETDOWN ORIFICE ISOLATION VALVES</th><th>OPEN
√</th></tr>
<tr><td>FCV-62-72</td><td>☐</td></tr>
<tr><td>FCV-62-73</td><td>☐</td></tr>
<tr><td>FCV-62-74</td><td>☐</td></tr>
</table></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE: Normal letdown pressure is 325 psig at normal operating temperature.</td></tr>
<tr><td></td><td>RO/BOP</td><td>9. ADJUST letdown pressure controller [PCV-62-81] output to obtain desired pressure.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>10. ADJUST letdown pressure controller [PCV-62-81] setpoint to match existing pressure.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>11. PLACE letdown pressure controller [PCV-62-81] in AUTO.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">NOTE: Normal letdown temperature is ~100°F.</td></tr>
<tr><td></td><td>RO/BOP</td><td>12. ADJUST [HIC-62-78A] to obtain desired letdown temperature, as indicated on [TI-62-78].</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>13. PLACE [HIC-62-78A] in AUTO.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">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.</td></tr>
<tr><td></td><td>RO/BOP</td><td>14. IF necessary to stabilize letdown temperature, THEN PERFORM the following:</td></tr>
<tr><td></td><td>RO/BOP</td><td>a. PLACE [HIC-62-78A] in MANUAL and ADJUST controller output in OPEN direction.</td></tr>
<tr><td></td><td>RO/BOP</td><td>b. WHEN letdown heat exchanger outlet temperature is stabilized at approximately 100°F, THEN PLACE [HIC-62-78A] in AUTO.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>RO/BOP</td><td>15. ENSURE high temperature divert valve [HS-62-79A] in DEMIN position.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Op Test No.: NRC 2010302 Scenario # 7 Event # 3 Page 17 of 44

Event Description: Pzr Level Controlling Channel LT 68-339 fails low

Time	Position	Applicant's Actions or Behavior
	RO	16. **ADJUST** charging and letdown as necessary to maintain RCP seal injection flow and pressurizer level.
		17. **IF** CCP suction is aligned to the RWST… N/A
		18. **GO TO** Section 4.1, step in effect.
	RO	Returns to AOP-I.04

Evaluator Note: **Continuing** with AOP-I.04 with Tech Spec Evaluation. EA-62-5, Letdown restoration completed.

Time	Position	Applicant's Actions or Behavior
		5. EVALUATE the following Tech Specs for applicability:
		• 3.3.1.1, Reactor Trip System Instrumentation Table 3.3-1 functional unit 11 Action 6: w/ number of OPERABLE Chs 1 less than total, SU and/or PWR OPs may proceed provided the following are satisfied: a. INOPERABLE Ch placed in tripped condition w/i 6 hrs. b. Minimum Chs OPERABLE met; however, INOPERABLE Ch may be bypassed up to 4 hrs for surveillance testing of other channels per Spec 4.3.1.1.1. • 3.3.3.7 Accident Monitoring Instrumentation Table 3.3-10 Functional Units 7 Action 2.a: w/ Chs one less than minimum channels required, restore INOPERABLE Ch to OPERABLE w/i 30 days or HT STBY w/i next 6 hrs & HT SHDN w/i next 6 hrs.
		6. 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.
		7. **MONITOR** reactor power:
		a. **CHECK** reactor in Mode 1 or 2.
		b. **MONITOR** core thermal power for unexpected changes.
	NOTE:	If performing AOP in conjunction with AOP-I.11 for an Eagle LCP failure… N/A
	Crew	8. **NOTIFY** MIG to remove failed pressurizer level channel from service **USING** appropriate Appendix: L-68-339 (L-459) Appendix I
		9. **GO TO** appropriate plant procedure.

Lead Examiner may cue the next event when Letdown is restored and Technical Specifications are addressed.

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Event Description: #4 Steam Generator narrow range level transmitter fails low.

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Simulator Operator: When directed, initiate Event 4</td></tr>
<tr><td colspan="3">Indications/Alarms
Annunciator:
1-M-3
• 1-XA-55-3C, D-2 “EAM/TTD SG LOOP 4 LO LO LEVEL”
1-M-6
• 1-XA-55-6B D-4, “LS-3-106B STEAM GENERATOR LOOP 4 LOW LOW WATER LEVEL”

Indications:
1-M-4
• 1-LT-3-106, SG-4 NR Level indicates downscale</td></tr>
<tr><td colspan="3">Evaluator Note: No Plant transient occurs due to median selection circuit</td></tr>
<tr><td>T + 40</td><td>BOP</td><td>Identifies alarm 1-XA-55-6B D-4, “LS-3-106B STEAM GENERATOR LOOP 4 LOW LOW WATER LEVEL”, acknowledges alarm and, notifies SRO</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>SRO</td><td>Direct entry to AOP-I.06, Steam Generator Instrument Malfunction, Section 2.2, Unit 1 S/G level instrument malfunction</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>AOP-I.06, Steam Generator Instrument Malfunction
Section 2.2, Unit 1 S/G Level Instrument Malfunction</td></tr>
<tr><td></td><td>SRO</td><td>1. EVALUATE the following Tech Specs for applicability:</td></tr>
<tr><td></td><td></td><td>• 3.3.1.1, Reactor Trip System Instrumentation
Table 3.3-1 Functional Unit 14.A & B, <u>Action 9</u>: w/ number of OPERABLE Chs 1 less than total, SU and/or PWR OPs may proceed provided the following are satisfied:
a. INOPERABLE Ch placed in tripped condition w/i 6 hrs.
b. affected protection set, Trip Time Delay for 1 affected SG (TS) adjusted to match the TTD for multiple affected SGs (TM) w/i 4 hrs.
c. Minimum Chs OPERABLE met; however, INOPERABLE Ch may be bypassed up to 4 hrs for surveillance testing of other channels per Spec 4.3.1.1.1.
• 3.3.2.1, Engineered Safety Feature Actuation System Instrumentation
Table 3.3-3 Functional Unit(s) 5a- <u>Action 17</u>: w/ OPERABLE Chs 1 less than Total, SU and/or PWR OPs may proceed provided the following conditions are satisfied:
a. INOPERABLE Ch placed in tripped condition w/i 6 hrs.
b. Minimum Chs OPERABLE is met; however, INOPERABLE Ch may be bypassed up to 4 hrs for surveillance testing of other Chs per Spec 4.3.2.1.1.
Table 3.3-3 Functional Unit(s) 6.c.i.a & b, 6.c.ii.a & b- <u>Action 36</u>: w/ # of OPERABLE Chs one less than Total Chs, SU and/or PWR OPs may proceed provided following conditions are satisfied:
a. INOPERABLE Ch placed in tripped condition w/i 6 hrs.
b. affected protection set, TTD for 1 affected SG (TS) adjusted to match TTD for multiple affected SGs (TM) w/i 4 hrs.
c. Minimum Chs OPERABLE met; however, INOPERABLE Ch may be bypassed up to 4 hrs for surveillance testing other Chs per Spec 4.3.2.1.1.
Table 3.3-3 Functional Unit(s) 8.c- <u>Action 22c</u>: w/ less than Minimum Number Chs</td></tr>
</table>

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Event Description: #4 Steam Generator narrow range level transmitter fails low.

Time	Position	Applicant's Actions or Behavior
		OPERABLE, declare interlock INOPERABLE, verify all affected Chs of functions below are OPERABLE or apply appropriate ACTION statement(s): c. Turbine Trip - SG Level Hi-Hi; Feedwater Isolation - SG Level Hi-Hi • 3.3.3.5 Remote Shutdown Instrumentation – N/A • 3.3.3.7 Accident Monitoring Instrumentation Table 3.3-10 Functional Unit 10 **Action 1.a**: w/ one less than minimum Chs required, restore INOPERABLE Ch to OPERABLE w/i 30 days or HT STBY w/i next 6 hrs & HT SHDN w/i next 6 hrs.
NOTE: If performing AOP in conjunction with AOP-I.11 for an Eagle LCP failure… N/A		
	Crew	2. **NOTIFY** IM to remove failed S/G level instrument from service **USING** appropriate Appendix: Loop 4: L-3-106 – Ch II - Appendix V
When Technical Specifications are addressed, the Lead Examiner may cue the next event		

Op Test No.:	NRC 2010302	Scenario #	7	Event #	5	Page	20 of 44
Event Description:	Feedwater Header PT-3-1 Fails Low						

Time	Position	Applicant's Actions or Behavior
Simulator Operator: When directed, initiate Event 5		
Indications/Alarms **Annunciator:** **1-M-3** • **1-XA-55-3C, C-1 "PS-3-4 NO 1 FW HTR PRESSURE HI"** **Indications:** **1-M-3** • **1-LR-2-12, HOTWELL LEVEL C CONDENSER decreasing trend** • **1-PC-46-20, 20A, 20B, MFPT 1A&1B Speed CONTROL speed demand increases** **1-M-4** • **1-FI-3-35A, 35B, 48A, 48B, 90A, 90B, 103A, 103B, SG-1 thru 4 SG FW INLET FLOW Chs 1&2 increasing flow- above steam flow**		
Significant Resultant Alarms/Indications: **Indications:** **1-M-4** • **SI-412, ROD Speed (& indicating lights) indicate outward rod motion (potential)**		
Evaluator Note: For this event, crew may respond per the Annunciator Response Procedure directly enter AOP-S.01 Section 2.1. Section 2.1 Step 1 is an IMMEDIATE ACTION step; the BOP may perform the action(s) associated with Step 1 from memory without direction.		
T + 45	BOP	Identifies alarm 1-XA-55-3C, C-1 "PS-3-4 NO 1 FW HTR PRESSURE HI", acknowledges alarm and, notifies SRO
	BOP	Takes manual control of MFP (Master) Speed control and reduce Feedwater pressure and flow.
	Crew	Refer to annunciator Response procedure.
	BOP	[1] **DISPATCH** operator to #1 feedwater heaters to verify the following valves open: a. 1-PSV-3-4 b. 1-PSV-3-14 c. 1-PSV-3-24
	BOP	[2] **REDUCE** feedwater pressure to ≤1100 psig.

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Event Description: Feedwater Header PT-3-1 Fails Low

Time	Position	Applicant's Actions or Behavior
	BOP	**[3] WHEN** pressure reduces to ~1100 psig, **THEN VERIFY** the above mentioned PSV's closed.
	BOP	**[4] IF** alarm still illuminated or by SRO decision, **THEN GO TO** AOP-S.01, Loss of Normal Feedwater.
	SRO	Direct entry to AOP-S.01, MAIN FEEDWATER Malfunction, Section 2.0, Operator Actions.
		AOP-S.01, MAIN FEEDWATER Malfunction Section 2.3, Failure of Automatic MFW Pump Control
	BOP/ SRO	1. Unit 1 Only: **DIAGNOSE** the failure and identify and Failure of MFW Pump Control
	SRO	Direct entry to AOP-S.01, MAIN FEEDWATER Malfunction, Section 2.3, Failure of Automatic MFW Pump Control
	NOTE: Step 1 is an IMMEDIATE ACTION.	
	BOP	1. **RESTORE** feedwater pressure:
		a. **PLACE** affected MFP speed controller(s) in MANUAL:
		• MFPT 1A & 1B Speed Control **OR** • MFPT 1A Speed Controller **OR** • MFPT 1B Speed Controller
		b. **ADJUST** speed on affected MFP(s) to restore feedwater pressure to normal (~1040 psig at full power).
	BOP	2. **DETERMINE** if MFP trip is needed:
		a. **CHECK** BOTH MFW pumps 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:

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Event Description: Feedwater Header PT-3-1 Fails Low

Time	Position	Applicant's Actions or Behavior
	CAUTION:	Feed flow transients may impact core thermal power.
		3. **MAINTAIN** steam generator level(s) on program.
	NOTE:	Appendix C may be used to determine program feedwater D/P for current power.
		4. **CHECK** Feed Flow Channels NORMAL. [M-4]
	CAUTION:	Reactor operation at low power levels for extended periods may challenge reactivity control due to xenon changes.
	BOP	5. **CHECK** Reactor power greater than 5%.
	CREW	6. **INITIATE** repairs on failed equipment.
		7. **GO TO** appropriate plant procedure.
		END OF SECTION

Lead Examiner may cue the next event when plant is stable with MFP speed control in manual.

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Event Description: Small Steam Leak Outside Containment Upstream Of Loop #3 MSIV

Time	**Position**	**Applicant's Actions or Behavior**
Simulator Operator: When directed, initiate Event 6		
Indications/Alarms **Indications:** **1-M-1** • **1-XR-57-107, GENERATOR MEGAWATTS decreasing** **1-M-3** • **1-LR-2-12, HOTWELL LEVEL C CONDENSER decreasing trend** **1-M-4** • **1-XI-92-5005C, 5006C, 5007C, 5008C, RX POWER Chs I-IV, N-41 – 44, NIS Power Range indicators increasing** **Significant Resultant Alarms/Indications:** **Indications:** **1-M-4** • **SI-412, ROD Speed (& indicating lights) indicate outward rod motion**		
T + 55	BOP	Identifies Rx Power indicators increasing, Generator Megawatts decreasing and notifies SRO.
	CREW	Monitors containment pressure, temperature and rad monitors for primary/ secondary contamination
	CREW	Diagnose Secondary leak outside containment based on NIS power increase, containment conditions normal, Hotwell level decreasing.
	SRO	Direct entry to AOP-S.05, Steam or Feedwater Leak
		AOP-S.05, Steam or Feedwater Leak Section 2.0, Operator Actions
		1. **MONITOR** personnel safety:
		a. **IF** steam or feedwater lines need to be immediately isolated to protect personnel, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **IF** leak is on steam lines **OR** source is unknown, **THEN CLOSE** MSIVs.
		3) **IF** leak is on feedwater lines **OR** source is unknown, **THEN PERFORM** the following:
		a) **TRIP** MFW pumps.
		b) **CLOSE** Feed Reg Valves.
		4) **GO TO** E-0, Reactor Trip or Safety Injection.

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Event Description: Small Steam Leak Outside Containment Upstream Of Loop #3 MSIV

Time	Position	Applicant's Actions or Behavior
Evaluator Note:	Crew is expected to move through AOP-S.05; probably about Step 8 to 10, they will identify that they cannot maintain at-power plant operations, transition back to Step 2 RNO and initiate a reactor trip.	
	BOP	2. **MONITOR** steam generator levels STABLE on program. ***(RNO required)***
		RNO: **IF** reactor trip is imminent due to low S/G level, **THEN PERFORM** the following:
		a. **TRIP** the reactor.
		b. **GO TO** E-0, Reactor Trip or Safety Injection.
v		
	BOP	3. **CHECK** the following:
		• S/G atmospheric relief valves CLOSED • Steam dumps CLOSED.
	BOP	4. **CHECK** main turbine on line.
	RO	5. **MONITOR** the following:
		• reactor power less than 100%
		• reactor power less than or equal to 100% (3455 MWt).
	RO	6. **MONITOR** T-avg/T-ref deviation less than 5°F.
	NOTE: Tech Spec LCO 3.6.1.4 is applicable if containment pressure exceeds 0.3 psig.	
	RO	7. **MONITOR** containment pressure STABLE.
Evaluator Note:	Hotwell level will fluctuate and secondary make-up flow will increase, perhaps be unable to keep up with Hotwell level loss due to the break size. The crew may exercise Step 8 RNO even though secondary make-up control is functioning correctly.	
	BOP	8. **MONITOR** hotwell level STABLE:
		• **VERIFY** LCV-2-9 maintaining hotwell level in AUTO.
	BOP	**RNO:** **INITIATE** makeup to hotwell:
		a. **PLACE** LIC-2-9, Auto Makeup, in MANUAL. [M-2]

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Event Description: Small Steam Leak Outside Containment Upstream Of Loop #3 MSIV

Time	Position	Applicant's Actions or Behavior
		b. **OPEN** LCV-2-9 **USING** LIC-2-9, Auto Makeup, as necessary to maintain hotwell level.
		c. **IF** loss of hotwell level is imminent, **THEN PERFORM** the following:
		1) **TRIP** the reactor.
		2) **WHEN** reactor is tripped, **THEN CLOSE** MSIVs.
		3) **GO TO** E-0, Reactor Trip or Safety Injection.
	BOP	9. **VERIFY** generator megawatts STABLE or DROPPING.
	BOP	10. **CHECK** the following containment parameters NORMAL:
		• Containment temperature
		• Containment humidity
		11. **VERIFY** NO abnormal leakage from S/G safety valves:
	BOP	• **NOTIFY** Security to visually scan east and west valve vault room areas on affected unit **OR**
	BOP	• **DISPATCH** operator to verify NO abnormal leakage from east and west valve vault rooms [inspect from outside rooms]
	SRO	12. **EVALUATE** EPIP-1, Emergency Plan Initiating Conditions Matrix. (Notify Shift Manager to Evaluate REP)
	BOP	
	NOTE: Tech Spec LCO 3.7.1.3 requires at least 240,000 gal for CST volume.	
	BOP	13. **MONITOR** CST levels greater than 70%.
	CREW	14. **VERIFY** leak IDENTIFIED and ISOLATED. ***(RNO required)***
	SRO	**RNO:** **EVALUATE** dispatching operators with radios to identify leak.
	SRO	**IF** leak CANNOT be isolated, **THEN EVALUATE** rapid shutdown **USING** AOP-C.03, Rapid Shutdown or Load Reduction.

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Event Description: Small Steam Leak Outside Containment Upstream Of Loop #3 MSIV

Time	Position	Applicant's Actions or Behavior
		15. **EVALUATE** actions required to restore plant to normal.
		16. **GO TO** appropriate plant procedure.

Lead Examiner may initiate next event to increase leak to a large break at or before this point when crew has determined there is a secondary leak outside containment.

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Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Simulator Operator: When directed, MODIFY Event 6- increase steam leak to break size</td></tr>
<tr><td colspan="3">Indications/Alarms
Annunicators:
1-M-6
• 1-AR-M6B A-7, "FS-3-35B STM GEN LOOP 1 STEAMFEEDWATER FLOW MISMATCH"
• 1-AR-M6B B-7, "FS-3-48B STM GEN LOOP 2 STEAMFEEDWATER FLOW MISMATCH"
• 1-AR-M6B C-7, "FS-3-90B STM GEN LOOP 3 STEAMFEEDWATER FLOW MISMATCH"
• 1-AR-M6B D-7, "FS-3-103B STM GEN LOOP 4 STEAMFEEDWATER FLOW MISMATCH

Indications:
1-M-1
• 1-XR-57-107, GENERATOR MEGAWATTS decreasing
1-M-3
• 1-LR-2-12, HOTWELL LEVEL C CONDENSER decreasing (w/ maximum make-up flow)
1-M-4
• 1-XI-92-5005C, 5006C, 5007C, 5008C, RX POWER Chs I-IV, N-41 – 44, NIS Power Range indicators increasing (exceeding >3% w/ secondary power- Turbine Impulse Pressure- Tref)

Significant Resultant Alarms/Indications:
Indications:
1-M-4
• SI-412, ROD Speed (& indicating lights) indicate unexpected outward rod motion</td></tr>
<tr><td>T + 65</td><td>SRO</td><td>Direct manual Rx Trip and MSIV closure; enter E-0, Rx Trip Or Safety Injection based on AOP-S.05 criteria:
• MONITOR step 5, Rx Power not stable
OR
• MONITOR step 8, Hotwell Level loss imminent)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>E-0, reactor Trip or safety Injection</td></tr>
<tr><td></td><td>RO</td><td>Perform E-0 Immediate Operator actions (IOAs)
1. VERIFY reactor TRIPPED:
<i>(RNO required)</i></td></tr>
<tr><td></td><td></td><td>RNO:
E-0 Step 1 RNO:
1- TRIP reactor.
2- IF reactor CANNOT be tripped, THEN PERFORM the following:
a. MONITOR status trees.
b. GO TO FR-S.1, Nuclear Power Generation/ATWS.</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

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Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		FR-S.1, Nuclear Power Generation/ATWS.
	RO	Identify ATWS after attempting manual Rx Trip initiation with both M-4 and M-6 Rx Trip Switches (1-RT-1 & 1-RT-2).
	BOP	Initiate a manual Main Turbine trip
	SRO	Direct entry to FR-S.1, Nuclear Power Generation/ATWS
	CAUTION: RCPs should NOT be tripped with reactor power greater than 5%.	
	NOTE: Steps 1 and 2 are immediate action steps.	
Evaluator Note: Crew may close MSIV's and attempt to isolate AFW to faulted S/.G WHEN REACTOR IS TRIPPED during performance of FR-S.1. When attempting to isolate AFW, level control valve will not close and crew may elect to stop 1B AFW Pump at that time.		
	RO	1. **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)***
Critical Task: Insert negative reactivity using control rods or boration prior to completion of FR-S.1		
CRITICAL TASK	RO	**RNO:** **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.
	BOP	2. **VERIFY** turbine TRIPPED: • ALL turbine stop valves CLOSED
		3. **CHECK** AFW System operation:

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Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		FR-S.1, Nuclear Power Generation/ATWS.
	BOP	a. MD AFW pumps RUNNING b. TD AFW pump RUNNING as necessary. ***(Not Running Tagged OOS in initial conditions)*** c. MD AFW LCVs in AUTO. d. TD AFW LCVs OPEN.
Critical Task:	Insert negative reactivity using control rods or boration prior to completion of FR-S.1	
CRITICAL TASK	RO/BOP	4. **EMERGENCY BORATE** RCS by performing the following:
	RO/BOP	a. **ENSURE** at least one CCP RUNNING.
	RO/BOP	b. **INITIATE** Emergency Boration **USING** EA-68-4.
	RO/BOP	c. **VERIFY** charging flow path established:
		• FCV-62-90 OPEN • FCV-62-91 OPEN • FCV-62-86 or FCV-62-85 OPEN
	RO/BOP	d. **CHECK** pressurizer pressure less than 2335 psig.
	RO/BOP	5. **VERIFY** Containment Purge isolated:
		a. **VERIFY** containment purge and vent dampers (System 30) CLOSED. [Panel 6K and 6L]
	RO/BOP	6. **MONITOR** SI NOT actuated:
		a. S.I. ACTUATED permissive DARK [M-4A, D4].
Evaluator Note:	May have manually actuated SI previously. Auto SI will likely occur when MSIV's are closed after Rx Trip in FR-S.1 and as the faulted S/G continues to depressurize.	
Evaluator Note:	Crew will likely have dispatched personnel prior to reaching this step. 2 AUOs will be dispatched- one to open the RTBs/RTByps in the AB; the second to open the MG supply breakers at the 480VAC Unit Boards in the TB.	
		7. Check reactor and turbine trip status
	RO	a. reactor tripped
	BOP	b. turbine TRIPPED:
		• ALL turbine stop valves CLOSED.

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Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		FR-S.1, Nuclear Power Generation/ATWS.
	RO	8. **MONITOR** reactor subcritical:
		a. Power range channels less than 5%.
		b. Intermediate range SUR NEGATIVE.
		c. **GO TO** Step 19.
	SRO	19. **ENSURE** status tree monitoring initiated.
	BOP	20. **MAINTAIN** S/G narrow range levels:
		a. Power range channels less than 5%.
		b. Between 10% [25% ADV] and 50%.
		21. **MONITOR** boration termination criteria:
	RO	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.
	SRO	22. **RETURN TO** procedure and step in effect.
		SRO directs crew to return to E-0 Step 1

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Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-0, reactor Trip or safety Injection
Evaluator Note: **Critical Task:** Isolate AFW flow to the Faulted SG (#3 SG) by stopping AFW flow within 10 minutes of E-0 entry from FR-S.1 **START TIME:** ________ **END TIME:** ________		
		Perform E-0 Steps 1-4 high level only; FR-S-1 directed E-0 Steps 1-4 and ES-0.5 performance
	RO	1. **VERIFY** reactor TRIPPED:
	BOP	2. **VERIFY** turbine TRIPPED:
	BOP	3. **VERIFY** at least one 6.9KV shutdown board ENERGIZED on this unit.
	RO	4. **DETERMINE** if SI actuated: ***(RNO for reference)***
		RNO: **DETERMINE** if SI required:
		a. **IF** any of the following conditions exists:
		• S/G pressure less than 600 psig, **OR** • RCS pressure less than 1870 psig, **OR** • Containment pressure greater than 1.5 psig,
		THEN ACTUATE SI.
		b. **IF** SI is NOT required… **N/A**
		5. **PERFORM** ES-0.5, Equipment Verifications WHILE continuing in this procedure.

Op Test No.:	NRC 2010302	Scenario #	7	Event #	7, 8, 9, 10	Page	32	of 44
Event Description:	Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.							

Time	Position	Applicant's Actions or Behavior
		E-0, reactor Trip or safety Injection
		FOLDOUT PAGE
		RCP TRIP CRITERIA – N/A
		EVENT DIAGNOSTICS
		• **IF** any S/G pressure is dropping uncontrolled, **THEN PERFORM** the following:
	RO/BOP	a. **CLOSE** MSIVs and MSIV bypass valves
		b. **IF** any S/G pressure continues to drop uncontrolled, **THEN PERFORM** the following:
	RO	1) **ENSURE** SI actuated.
		2) **IF** at least one S/G is intact (S/G pressure controlled or rising), **THEN ISOLATE** AFW to faulted S/G(s):
		• **CLOSE** AFW level control valves for faulted S/G(s) • **IF** any AFW valve for faulted S/G CANNOT be CLOSED, **THEN PERFORM** Appendix E, Isolating AFW to Faulted S/G.
		3) **ENSURE** at least one of the following conditions met:
		• total AFW flow greater than 440 gpm **OR** • Narrow Range level greater than 10% [25% ADV] in at least one intact S/G.
Evaluator Note:	**Critical Task:**	Isolate AFW flow to the Faulted SG (#3 SG) by stopping AFW flow within 10 minutes of E-0 entry from FR-S.1 (Failed AFW LCV isolation)
		APPENDIX E **ISOLATING AFW TO FAULTED S/G**
		1. **IF** motor-driven AFW LCV for faulted S/G CANNOT be closed, **THEN PERFORM** the following:
Critical Task		a. **IF** at least one other AFW pump is available, **THEN PLACE** affected MD AFW pump in PULL TO LOCK. b. **ENSURE** at least one of the following:
		• total AFW flow greater than 440 gpm **OR** • Narrow Range level greater than 10% [25% ADV] in at least one intact S/G.
		c. **DISPATCH** personnel to locally isolate MD AFW to faulted S/G **USING** EA-3-11, Local Isolation of MD and TD AFW.
		d. **WHEN** MD AFW flowpath to faulted S/G is locally isolated, **THEN ENSURE** affected MD AFW pump RUNNING.

Op Test No.: NRC 2010302 Scenario # 7 Event # 7, 8, 9, 10 Page 33 of 44

Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-0, reactor Trip or safety Injection
	NOTE:	TDAFW pump steam supply will automatically swap from S/G #1 to S/G #4 after 60 second time delay when FCV-1-17 or -18 is closed.
		2. **IF** turbine-driven AFW LCV for faulted S/G CANNOT be closed, **THEN PERFORM** the following:
		a. **IF** at least one MD AFW pump is available to supply an intact S/G, **THEN CLOSE** FCV-1-17 or FCV-1-18 to stop TD AFW flow.
		b. **ENSURE** at least one of the following:
		• total AFW flow greater than 440 gpm **OR** • Narrow Range level greater than 10% [25% ADV] in at least one intact S/G.
		c. **DISPATCH** personnel to locally isolate TD AFW to faulted S/G **USING** EA-3-11, Local Isolation of MD and TD AFW.
		d. **WHEN** TD AFW flowpath to faulted S/G is locally isolated, **THEN PERFORM** the following:
		1) **IF** S/G #1 or 4 is faulted, **THEN ENSURE** steam supply from faulted S/G isolated by closing FCV-1-15 (S/G #1) or FCV-1-16 (S/G #4). 2) **ENSURE** FCV-1-17 and FCV-1-18 OPEN. 3) **ENSURE** TD AFW pump RUNNING.
		END OF TEXT
		Return to E-0, reactor Trip or safety Injection, Step 6…
		6. **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.
	RO	7. **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

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Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-0, reactor Trip or safety Injection
		b. ENSURE MSIVs and MSIV bypass valves CLOSED
		c. ENSURE applicable Foldout Page actions COMPLETED
	RO	8. **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
	RO	9. **MONITOR** RCS temperatures: • IF any RCP running, THEN CHECK T-avg stable at or trending between 547°F and °F. OR • IF RCPs stopped, THEN CHECK T-cold stable or trending to between 547°F and 552°F.
	RO	10. **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.
	CREW	11. **DETERMINE** 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 Required)***

Op Test No.:	NRC 2010302	Scenario #	7	Event #	7, 8, 9, 10	Page	35 of 44

Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-0, reactor Trip or safety Injection
	SRO	**RNO:** **PERFORM** the following:
	SRO	a. **MONITOR** status trees – Status tree monitoring previously initiated.
		b. **GO TO** E-2, Faulted Steam Generator Isolation.
		Crew transitions to E-2, Faulted Steam Generator Isolation.

Op Test No.: NRC 2010302 Scenario # 7 Event # 7, 8, 9, 10 Page 36 of 44

Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-2, Faulted Steam Generator Isolation
Evaluator Note:		**Critical Task:** Isolate AFW flow to the Faulted SG (#3 SG) by stopping AFW flow within 10 minutes of E-0 entry from FR-S.1 **START TIME:** ___________ **(From E-0 Entry)** **END TIME:** ___________
	CAUTION:	Unisolating a faulted S/G or secondary break should NOT be considered UNLESS needed for RCS cooldown.
	BOP	1. **CHECK** MSIVs and MSIV bypass valves CLOSED.
	BOP	2. **CHECK** ANY S/G secondary pressure boundary INTACT:
		• Any S/G pressure CONTROLLED or RISING
	BOP	3. **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.
		• If the TD AFW pump is the only source of feed flow, isolating both steam supplies will result in loss of secondary heat sink.
		4. **ISOLATE** Faulted S/G(s):
	BOP	a. **ENSURE** MFW isolated to faulted S/G(s) by any of the following:
		• feedwater isolation valve CLOSED [M-4]
		OR
		• feedwater regulating valve and bypass valve CLOSED [M-3].
	BOP	b. **ENSURE** AFW isolated to faulted S/G(s):
		• **CLOSE** MD AFW LCV
		• **CLOSE** TD AFW LCV and **PLACE** in PULL TO LOCK.

Op Test No.: NRC 2010302	Scenario # 7	Event # 7, 8, 9, 10	Page 37 of 44

Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-2, Faulted Steam Generator Isolation
	BOP	c. **CHECK** S/G #1 or #4 faulted. ***(RNO required)***
		RNO: c. **GO TO** Substep 4.e.
	BOP	d. **VERIFY** S/G blowdown valves CLOSED.
	BOP	e. **VERIFY** atmospheric relief CLOSED.
	BOP	5. **CHECK** CST level greater than 5%.
	BOP	6. **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.
	BOP	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.
		e. **WHEN** S/G samples completed, **THEN CLOSE** blowdown isolation valves.

Op Test No.:	NRC 2010302	Scenario #	7	Event #	7, 8, 9, 10	Page	38 of 44

Event Description: Steam Leak to Break O/S Containment Upstream Lp #3 MSIV w/ ATWS, Rods fail to move in auto (10 sec delay) & #3 SG MDAFWP Lvl Control Vlv fails open.

Time	Position	Applicant's Actions or Behavior
		E-2, Faulted Steam Generator Isolation
	RO/ SRO	7. **CHECK** SI termination criteria:
		a. RCS subcooling based on core exit T/Cs greater than 40°F.
	BOP	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.
	RO	c. RCS pressure stable or rising.
	RO	d. Pressurizer level greater than 10% [20% ADV].
	SRO	e. **GO TO** ES-1.1, SI Termination.
	SRO	8. **GO TO** E-1, Loss of Reactor or Secondary Coolant.
		END

Lead Examiner may terminate the scenario at E-2 Step 7.e, SI Termination criteria determination.

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Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		Evaluator Note: BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken) to SRO.
	BOP	1. **VERIFY** D/Gs RUNNING.
	BOP	2. **VERIFY** D/G ERCW supply valves OPEN.
	BOP	3. **VERIFY** at least four ERCW pumps RUNNING
	BOP	4. **VERIFY** CCS pumps RUNNING
		• Pump 1A-A (2A-A) • Pump 1B-B (2B-B) • Pump C-S.
	BOP	5. **VERIFY** EGTS fans RUNNING.
	BOP	6. **VERIFY** generator breakers OPEN.
	Crew	7. **NOTIFY** at least two AUOs to report to MCR to be available for local actions.
	BOP	8. **VERIFY** AFW pumps RUNNING: a. MD AFW pumps b. 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	9. 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.

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Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
ES-0.5, EQUIPMENT VERIFICATIONS		
	BOP	10. **VERIFY** MFW Isolation: a. MFW pumps TRIPPED b. **ENSURE** the following: • MFW regulating valves CLOSED • MFW regulating bypass valve controller outputs ZERO • MFW isolation valves CLOSED
	BOP	11. **MONITOR** ECCS operation:
		a. **VERIFY** ECCS pumps RUNNING: • CCPs: • RHR pumps • SI pumps
		b. **VERIFY** CCP flow through CCPIT.
		c. **CHECK** RCS pressure less than 1500 psig.
		d. **VERIFY** SI pump flow.
		e. **CHECK** RCS pressure less than 300 psig.
		f. **VERIFY** RHR pump flow.
	BOP	12. **VERIFY** ESF systems ALIGNED:
		a. Phase A ACTUATED: • PHASE A TRAIN A alarm LIT [M-6C, B5]. • PHASE A TRAIN B alarm LIT [M-6C, B6].
		b. Cntmt Vent Isolation ACTUATED: • CNTMT VENT ISOLATION TRAIN A alarm LIT [M-6C, C5]. • CNTMT VENT ISOLATION TRAIN B alarm LIT [M-6C, C6].
		c. Status monitor panels: • 6C DARK • 6D DARK • 6E LIT OUTSIDE outlined area • 6H DARK • 6J LIT.

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Event Description: Equipment verifications

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		d. Train A status panel 6K: • CNTMT VENT GREEN • PHASE A GREEN
		e. Train B status panel 6L: • CNTMT VENT GREEN • PHASE A GREEN
	BOP	13. **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].
		d. **ENSURE** RCPs STOPPED.
		e. **VERIFY** Phase B valves CLOSED: • Panel 6K PHASE B GREEN. • Panel 6L PHASE B GREEN.

Op Test No.:	NRC 2010302	Scenario #	7	Event #	ES-0.5	Page	42 of 44
Event Description:	Equipment verifications						

Time	Position	Applicant's Actions or Behavior
		ES-0.5, EQUIPMENT VERIFICATIONS
		f. **WHEN** 10 minutes have elapsed, **THEN ENSURE** containment air return fans RUNNING.
		14. **MONITOR** if containment vacuum relief isolation valves should be closed:
		a. **CHECK** containment pressure greater than 1.5 psig.
		b. **CHECK** cntmnt vacuum relief isolation valves CLOSED: [Pnl 6K MANUAL] • FCV-30-46 • FCV-30-47 • FCV-30-48.
	BOP	15. **CHECK** secondary and containment rad monitors **USING** the following: • Appendix A, Secondary Rad Monitors (attached) • Appendix B, Containment Rad Monitors. (attached)
	BOP	16. **WHEN** directed by E-0, **THEN PERFORM** Appendix D, Hydrogen Mitigation Actions.
		17. **CHECK** 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	18. **DISPATCH** personnel to perform EA-0-1, Equipment Checks Following ESF Actuation.
	BOP	19. **ENSURE** plant announcement has been made regarding Reactor Trip and SI.
Evaluator Note:		**BOP completes ES-0.5 including Appendices A & B and reports completion (including any discrepancies and actions taken) to SRO.**
		END (ES-0.5, EQUIPMENT VERIFICATIONS)

Op Test No.: NRC 2010302 Scenario # 7 Event # ES-0.5 Page 43 of 44

Event Description: Equipment verifications

(ES-0.5, EQUIPMENT VERIFICATIONS)

APPENDIX A
SECONDARY RAD MONITORS

	BOP	1. **CHECK** following rad monitors including available trends prior to isolation: • Condenser exhaust recorder RR-90-119 • S/G blowdown recorder RR-90-120 • Main steam line rad monitors • Post-Accident Main Steam Line rad recorder RR-90-268B points 3 (blue), 4 (violet), 5 (black), and 6 (brown). [M-31 (back of M-30)]
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.

END OF TEXT

APPENDIX B

CONTAINMENT RAD MONITORS

	BOP	1. **CHECK** following rad monitors: • Upper containment high range rad monitors RM-90-271 and RM-90-272 NORMAL [M-30] • Lower containment high range rad monitors RM-90-273 and RM-90-274 NORMAL [M-30] • Containment rad recorders RR-90-112 and RR-90-106 NORMAL [M-12] (prior to isolation).
	BOP	2. **IF** secondary radiation is HIGH, **THEN** **ENSURE** Unit Supervisor notified.

END OF TEXT

Op Test No.:	NRC 2010302	Scenario #	7	Event #	Critical Task(s)	Page	44 of 44
Event Description:	Critical Task Listing						

Critical Tasks:	Critical Task Statement	Action Location	ESG pg #
1.	Insert Negative reactivity using control rods or boration prior to completion of FR-S.1	FR-S-1 Step 1 RNO; Step 4	28 29
2.	Isolate AFW flow to the Faulted SG (#3 SG) by stopping AFW flow within 10 minutes of E-0 entry from FR-S.1 Time critical action per 0-TI-OPS-000-004.0 r1	E-0 POAs (incl FOP items)	32 or 35
		ES-0.5 Step 10.b	42

TVA

Sequoyah Nuclear Plant

Unit 1 & 2

General Operating Instructions

7

0-GO-5

NORMAL POWER OPERATION

Revision 0065

VFW [illegible], today's date

Quality Related

Level of Use: Continuous Use

Effective Date: 03-12-2010

Responsible Organization: OPS, Operations

Prepared By: W. T. Leary

Approved By: P. R. Simmons

Current Revision Description

Revised to address requirements overlooked in the initial issuance of the guidance for compliance with NERC Reliability Standards, VAR-002. These changes make no alteration to the operation of any equipment and are changes to required administrative notifications only. These changes are therefore minor editorial changes as defined in SPP-2.2.

PERFORMANCE OF THIS PROCEDURE IMPACTS REACTIVITY.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

This General Operating (GO) Instruction provides guidance for power ascension from approximately 30 to 100% power, at power conditions, power reduction from 100 to 30% power, Power Coastdown at End of Life operations, and Load Follow operations.

This instruction provides additional guidance for turbine control restoration following a turbine runback.

1.2 Scope

This GO contains the following sections:

5.1 Power Ascension From 30% Power to 100%

5.2 At Power Conditions

5.3 Power Reduction From 100% to 30%

5.4 Power Coastdown at End of Life

5.5 Load Follow Operations

2.0 REFERENCES

2.1 Performance References

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

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

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

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

E. 1,2-SO-2-9, *Condenser Vacuum and Turbine Steam Seal Systems Operation*

F. 0-SO-12-1, *Auxiliary Boiler System*

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

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

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

J. 1,2-SO-62-1, *Chemical and Volume Control System*

K. 0-SO-62-7, *Boron Concentration Control*

L. 1,2-SO-62-9, *CVCS Purification System*

M. 0-SO-68-3, *Pressurizer Spray and Heater Pressure Control System*

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

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

P. 0-SI-OPS-092-078.0, *Power Range Neutron Flux Channel Calibration By Heat Balance Comparison*

Q. 0-SI-CEM-000-050.0, *72-Hour Chemistry Requirements*

R. 0-SI-CEM-030-407.2, *Radioactive Gaseous Waste Effluent Particulate and Iodine Dose Rates from Shield and Auxiliary Building Exhausts (Weekly/Special) and Condenser Vacuum Exhausts (Special)*

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

T. 0-SI-OPS-000-001.0, Initial Startup System Parameter Log

U. TI-40, *Determination of Preconditioned Reactor Power*

2.1 Performance References (continued)

V. 2-SO-98-1, *Distributed Control System*

2.2 Developmental References

A. Memorandum from System Engineering concerning MSR operation - RIMS S57 880322 999

B. Memo from Reactor Engineering - RIMS S57 941219 934

C. S57-880322-999 and S57-880808-851

D. W Letter GP89-076 (RIMS No. S53 890427 984)

E. W Letter GP 89-155 (RIMS S57 891026 972)

F. W Letter GP 86-02(B44 861112 002)

G. SSP-2.3, *Administration of Site Procedures*

H. TVA-NQA-PLN89-A

I. GOI-10, *Reactivity Control at End of Cycle Life* (Trojan Nuclear Plant)

J. FSAR, Section 13.5

K. Memo from Reactor Engineering - August 6, 1996 (G Bair)

L. NERC Reliability Standard, VAR-002-1.1b

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

A. To ensure that NIS Reactor Power level indications remain within 2% of true power during power level changes, a check should be performed about every 20% power level change, when greater than 15% power, by comparing calorimetric power to each NIS Power Range drawer. The 20% power level check does not preclude the operating crews from making necessary changes in response to changing plant conditions.

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 or equal to 250°F.

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

C. The following should be used to determine the most accurate reactor power indication for comparison with NIS:

- When reactor power is greater than 15%, use LEFM calorimetric power indication (U2118).
- If LEFM is NOT available, then use average loop ΔT (UO485 or M-5 indicators) up to 40%. Above 40%, use computer point U1118.

D. 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 Ltr GP 89-155; RIMS S57 891026 972)

E. Pressurizer heaters and sprays may be operated as required to maintain pressurizer and RCS boron concentration within 50 ppm. If loop boron concentration is changed by 20 ppm or greater, use the pressurizer backup heaters to initiate automatic spray (if available). If Normal Spray is NOT available, then use Auxiliary Spray (1, 2-SO-62-1, Section 8.7) in conjunction with pressurizer backup heaters.

3.1 Precautions (continued)

F. Condensate DI polishing operations during power ascension are controlled by staying within system parameters and by recommendations from the Chemistry Section.

G. The valve position limiter should be periodically positioned approximately 10% above the current governor control indications (keeps governor valves off of the limiter) as turbine load is changed. 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.

H. Any off-frequency turbine operation is to be reported to Engineering for record keeping. The report will include duration and magnitude of off-frequency operation.

I. 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.

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

K. Initial Startup After Refueling - 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 at the following RTP hold points. Reactor Engineering and/or Systems Engineering will determine procedure performance. [C.3]

   1. At < 50% RTP a flux map and single point alignment, a hot channel factor determination, an axial imbalance comparison, and a PR NIS calibration will be performed. The PR high range trip setpoint will then be increased to its normal value of 109%.

   2. At < 75% RTP, calorimetric calculations and RCS flow verification may be performed, EAGLE-21 updated prior to increasing power, a flux map, a hot channel factor determination, an axial imbalance comparison may be required if not performed at < 50%, a detector calibration (if Δ AFD ≥ 3%), and a PR NIS calibration may be performed.

3.1 Precautions (continued)

3. If not performed at 75% hold point, an axial imbalance comparison and a detector calibration (if Δ AFD ≥ 3%) should be performed at ~ 100% RTP. Engineering will determine if PR NIS calibration must be performed. Calorimetric calculations, RCS flow verification, a hot channel factor determination, and a reactivity balance will be performed and EAGLE-21 updated. Reactor Engineering will notify Operations that normal full power operations may proceed.

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

5. N/A 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.

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

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

   b. 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.

   c. 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.*

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

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

L. N/A Declared fuel defects, as determined by the Fuel Reliability Assessment Team or the Shift Manager, have limited ramp rates during Reactor Power increases as specified in TI-40.

M. TI-40 power increase limits that are exceeded, in any one hour, are evaluated in accordance with SPP-3.1.

3.1 Precautions (continued)

N. Power Coastdown At End Of Life:

N/A

1. Reactor power changes should be limited to less than or equal to 1% per hour to avoid causing xenon peaking which could force a plant shutdown.

2. Do not perform unnecessary unit power maneuvers or testing (e.g., turbine valve testing). Such testing could result in an uncontrollable Xenon oscillation.

3. Nonessential work on systems which could cause a plant upset should be deferred.

4. Secondary Plant runbacks such as Main Feed Pump Turbine trip or #3 Heater Drain Tank runback will require a unit shutdown if Reactor power is not promptly returned to pre-transient level due to the resulting severe Xenon transient. If a system power alert is in effect, and electrical generation is critical, unit load should be reduced as necessary keeping T_{AVG} on program. Contact Reactor Engineering for an evaluation and guidance concerning unit shutdown or reduction of load.

5. Management should be consulted to evaluate the feasibility of a unit restart if a reactor trip occurs with RCS equilibrium boron concentration less than 50 ppm. If the reactor is to be restarted, the power level shall be limited to nominal pre-trip power level.

O. Axial Flux Difference Management:
When the reactor is operating at a steady power or during normal load changes, maintain ΔI within the operating limits of the Core Operating Limits Report (COLR). It is recommended that the core axial flux difference (AFD) be maintained within ± 5% of the target band at all times, excluding the performance of 0-PI-NUC-092-036.0, "Incore - Excore Calibration," and End of life power coast downs. Operating time outside the band, which is given in TI-28 Attachments 1 and 2, should be minimized. Reactor Engineering should be contacted if time out of the ± 5% target band exceeds approximately 30 minutes.

P. The position of control bank D should normally be $\geq$ 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 $\geq$ 165 steps. If rod position is more than 5 steps below this guidance for long term, then impact may occur to safety analysis assumptions.

Q. During heatup and cooldown transients, RCS density changes will cause changes in NIS indicated power. At constant reactor power, a 1°F change in T_{AVG} may cause as much as a 1% (or more) change in indicated NIS power.

3.1 Precautions (continued)

R. The following limitations are applicable to Unit Two ONLY.

N/A 1. In winter months #7 HDTP capacity is not adequate to pump #6 Heater drains when all Condensate Demineralizer pumps are in service. Current practice is to run two Cond DI Pumps and / or throttle the condensate system to reduce backpressure. The preferred method is to throttle condensate pressure instead of running only two Condensate Demineralizer booster pumps at full power due to pump runout concerns.

2. Siemens-Westinghouse analysis has determined that the maximum unit power with one MFP operation is 65% under worst case conditions. The plant could operate higher if plant conditions permit.

3. MFP flow from the lead MFP should not exceed 53.7% of the total flow. Flow rates above this would result in HP steam flow to the lead MFPT. Computer points 1(2)UO504 and UO505 can be used to monitor.

S. Voltage Control

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Operation of the Main Generator without Automatic Voltage Control could impact grid voltage requirements. Refer to GOI-6 for MVAR limits.

2. When the Main Generator is connected to the grid, the voltage regulator shall be operated in Automatic, unless coordinated with the Transmission Operator (SELD).

3. Main Generator operation outside of the Transmission Voltage Schedule requires coordination with the Transmission Operator, and notation in the operator's Log of time, reason, and that the Transmission Operator notification was made.

4. When directed to modify voltage, the Generator Operator shall comply (within plant procedural requirements) or provide an explanation of why the schedule cannot be met.

5. While the Main Generator is tied to the grid perform the following:

   a. The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between AUTO and Manual as soon as practical but notification shall be within 30 minutes.

3.1 Precautions (continued)

b. The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfers between Manual and Auto.

c. All position changes (to and from Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration and notifications made.

T. Reliability Directives and Protective Relay/Equipment Failures

NOTE

Failure to comply with the NERC VAR-002 requirement could result in a Utility Violation and / or monetary penalties.

1. Plant Operations shall notify the Transmission Balancing Authority (BA) or Transmission Operator of protective relay or equipment failures that creates a creditable risk to Plant Generation. A creditable risk to generation represents a potential reduction in transmission system reliability.

2. Reliability Directives to the Generator Operator are via the Balancing Authority or Transmission Operator. Required action time may range from immediate to no longer than 30 minutes. Actions shall be taken without delay. The directives may be associated with preventing or clearing Local System issues, or neighboring system issues.

3. Plant operations shall take timely actions as directed by the Balancing Authority or Transmission Operator to mitigate critical conditions to return the bulk electrical system to a reliable state. Plant operations shall comply with Balancing Authority or Transmission Operator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements.

4. Plant Operations shall immediately inform the Balancing Authority or Transmission Operator of the inability to perform directives so that the TVA Reliability Entities may implement alternate remedial actions.

3.2 Limitations

A. When the axial flux difference monitor alarm is inoperable, the AFD must be logged every hour by performing 0-SI-NUC-000-044.0.

(SR 4.2.1.1.a.2 & 4.2.1.1.b)

B. When both the plant computer and NIS QPTR alarm systems are inoperable, the QPTR must be calculated every 12 hours by performing 0-SI-NUC-000-133.0. (SR 4.2.4.1.b)

C. Do not exceed a load change rate of plus or minus 5% per minute or a step change of 10%.

D. River water temperatures shall be maintained within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0.

NOTE

Westinghouse should be contacted if the turbine is operated outside of its operating limits as stated below.

E. To prevent high vibratory stresses and fatigue damage to the last stage turbine blading, do not operate the turbine 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)
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.

F. Do not allow the generator to become underexcited.

G. 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 0-SI-CEM-000-050.0, 0-SI-CEM-030-407.2 and 0-SI-CEM-000-415.0 due to the thermal power change.

3.2 Limitations (continued)

H. The following Main Turbine vibration limitations and actions should be adhered to:

1. Vibration levels which exceed 7 mils (alarm setpoint) should be verified by Predictive Maintenance Group.

2. Vibration levels greater than 7 mils and less than 14 mils should be continuously monitored by Predictive Maintenance Group.

3. IF vibration level is greater than or equal to 14 mils, THEN TRIP the turbine.

I. Westinghouse recommends that if any throttle valve is held closed for more than 10 minutes, then it should be re-tested immediately upon reopening in accordance with 1,2-PI-OPS-047-002.0.

J. The generator may be operated without a bus duct cooler up to approximately 729 MW turbine load.

K. To ensure sufficient voltage for a safe shutdown after loss of both units, voltage and reactive power should be maintained within the limits of GOI-6.

L. With LEFM calorimetric power indication available, full power operation is defined as approximately 3455 MW_T not to exceed 3455.0 MW_T averaged over a 8-hour period. [C.1] If LEFM is available, power shall be monitored using plant computer point U2118 Instantaneous Value. **DO NOT** allow average thermal power to exceed 3455 MW thermal for two consecutive hours. Every effort should be made to maintain core thermal power 10 minute average less than 3455 MWt.

M. The following restrictions apply if LEFM calorimetric power indication (U2118) is unavailable:

1. Applicable action of TRM 3.3.3.15 must be entered.

2. AFD limits in COLR and TI-28 must be made more restrictive by 1%.

3. Rod insertion limits in COLR must be raised by 3 steps.

4. If reactor power is greater than 40%, power should be monitored using U1118. If U1118 is also unavailable, use the highest reading NIS channel.

5. If reactor power is less than 40%, use the RCS average ΔT as the preferred method for determining power level.

3.2 Limitations (continued)

N. IF equilibrium conditions are achieved, after exceeding by 10% or more of rated thermal power the thermal power at which the heat flux hot channel factor was last determined, THEN conditional performance of 0-SI-NUC-000-126.0, Hot Channel Factor Determination is required.

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. With one LP heater string out of service (isolated), power is limited to 86% (Unit 1) or 90% (Unit 2). This is based on LP turbine blading limitations. (Ref: DCN E21203A).

Q. #3 heater drain tank should remain drained with LCV-6-105A and B failed open (per 1, 2-SO-5-2) until reactor power exceeds ~45-50%. This will prevent intermediate heater string isolations if a turbine trip occurs at lower power levels. If a level is established in the number 3 Heater Drain Tank prior to exceeding P-9 setpoint (50% power), a turbine trip will result in Intermediate Pressure Heater string isolation(s).

STARTUP No. 1 **Unit** 1 **Date** Today

4.0 PREREQUISITES

NOTES

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

2) Prerequisites may be completed in any order.

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

[2] T_{AVG} is being maintained within 1.5°F of T_{REF}. ☑

[3] SG level controls are being maintained in AUTO (**N/A** if auto control **NOT** available). ☑

[4] Control rods are being maintained within the operating band of Core Operating Limits Report (COLR) (**N/A** if shutting down due to dropped or misaligned rod). ☑

[5] Steam dump control system is in the T_{AVG} mode (**N/A** if Tavg Mode **NOT** available). ☑

[6] The EHC system should be in OPER AUTO (pushbutton lit). ☑

[7] Generator pressurized with hydrogen according to capability curve. (TI-28, Fig. A.I4) ☑

[8] PRMs are being maintained within ±2% of core thermal power readings. ☑

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.

4.0 PREREQUISITES (continued)

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

Print Name	Initials
Reactor Operator 1	RO1
Reactor Operator 2	RO2
Sr Reactor Operator	SRO
Shift Manager	SM
Reactor Engineer	RE
Chemistry Supervisor	CS

5.0 INSTRUCTIONS

CAUTION

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

NOTES

1) Radiation Protection should be notified during normal plant operations if power level increases or decreases are either stopped or started.

2) Guidance on restoration of EHC Controls after a BOP runback is contained in Appendix B, *Turbine Runback Restoration*. [C.4]

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100%

NOTES

1) Failure to comply with the NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.

2) The Transmission Operator (SELD) shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]

3) The Transmission Operator (SELD) shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.

4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.

5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.

6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made.

7) 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 30 minutes.

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

[1] **ENSURE** Section 3.0 Precautions and Limitations has been reviewed and Section 4.0, Prerequisites complete. JRO

[2] **VERIFY** from Chemistry Section that SG and feedwater secondary chemistry is within acceptable limits. ☑

Chemistry personnel contacted

[3] **IF** this is a startup following refueling, **THEN**

ENSURE applicable portions of 0-RT-NUC-000-001.0 are **COMPLETE** for operation above 35% power.

N/A RB
Rx Engr.

STARTUP No. /   **Unit** /   **Date** /

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) This step may be performed out of sequence as necessary to meet power level.

2) 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.

[4] **PERFORM** the following at approximately 35% reactor power:

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

CALCULATE Calorimetric power:

Calorimetric power= U2118 $\frac{N/A}{34.55}$ = N/A %

N/A ☐

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

CALCULATE reactor power:

Average value of RCS ΔT (U0485)= N/A % N/A

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

N-41	(XI-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 ☐

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

PERFORM 0-SI-OPS-092-078.0.

STARTUP No. 1 **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[4.5] **MONITOR** PRMs deviation from core thermal power continuously during performance of this procedure
AND
PERFORM 0-SI-OPS-092-078.0 if the deviation is >2%. RO

NOTES

1) With reactor engineering concurrence, power increase per steps 5.1[6] through 5.1[10] may be performed in parallel with this step.

2) If startup is following refueling operations and secondary side chemistry is acceptable for power increase, then N/A Step 5.1[5]. (Startup Reactivity Calibrations and Tests will be performed at ≈ 45% Reactor Power if not performed at ≈ 30% Power).

[5] **IF** startup is following refueling activities and secondary chemistry hold is precluding power ascension, **THEN**

ENSURE the following have been performed prior to exceeding 50% rated thermal power: (May be performed in any order)

[5.1] 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

N/A Rx Eng N/A Date

[5.2] 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

Rx Eng Date

Today's Date

[5.3] 0-PI-NUC-092-002.0, Detector Single Point Alignment.

Rx Eng Date

STARTUP No. 1 **Unit** 1 **Date** today

5.1 Power Ascension From 30% to 100% (continued)

[5.4] 0-PI-IXX-092-N45.0, PR NIS Calibration.

N/A MIG N/A Date

SRO
plays date

[5.5] PR High Flux Trip reset to 109%. [C.3].

MIG Date

[5.6] Applicable portions of 0-RT-NUC-000-001.0 **COMPLETE** for operation above 50% power.

Rx Eng Date

[6] **DETERMINE** the following from TI-40 and **RECORD** in narrative log and below:

[6.1] Reactor preconditioned power level. N/A ☑

[6.2] Ramp rate restrictions: ☐

N/A %/hour up to N/A % reactor power

%/hour up to % reactor power

%/hour up to % reactor power

[6.3] Restrictions on AFD and rod withdrawal rate: (N/A if not applicable) ☑

Per Rx Spreadsheet

[7] **VERIFY** TI-40 limits listed above.

RE
Rx Eng

SM
SM

[8] **MONITOR** TI-40 limits (using ICS trend features if available). ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> Raising load on the Main Generator will cause VARs to trend in the negative direction (toward incoming). This will require raising generator voltage. Refer to GOI-6 Section E for MVAR limits for generator stability. Refer to precautions R, S, T, and V.

[9] **PERFORM** the following as required:

- [9.1] IF Automatic Voltage Control is in service,
  THEN
  ADJUST Main Generator VARs **USING**
  [HS-57-22] Exciter Voltage Auto Adjuster as necessary during power escalation. ______

- [9.2] **IF** necessary to remove Automatic Voltage Control from service,
  THEN
  PERFORM required steps in Appendix E. ______

- [9.3] IF Automatic Voltage Control is NOT in service,
  THEN
  ADJUST Main Generator VARs **USING**
  [HS-57-23] Exciter Voltage Base Adjuster as necessary during power escalation. N/A ______

> **NOTES**
>
> 1) Steps 5.1[10] through 5.1[16] may be performed concurrently or out of sequence.
>
> 2) Valve position limit and governor control meter are displayed on EHC Display panel 1,2-XX-047-2000 (M-2).
>
> 3) 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.

[10] **INITIATE** power increase to between 45 and 49% and

MAINTAIN valve position limit approximately 10% above current governor control indication as turbine load is changed. ☒

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[11] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}.(0-SO-62-7) ☑

[12] **PERFORM** the following during power increase:

NOTE

T_{AVG} will be programmed from 547°F at no load to 578.2°F at 100% load at a rate of 0.312°F per % power.

[12.1] **MONITOR** T_{AVG} following TREF on program. ☑

[12.2] **MONITOR** pressurizer level on program (25 to 60% as a function of T_{AVG}). ☑

NOTE

If LEFM is available, computer point U2118 should be used as true reactor power. If LEFM is NOT available, use U1118 when greater than or equal to 40% and the average value of RCS ΔT when less than 40%.

[12.3] **MONITOR** 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. ☑

NOTE

Generator MVARs may be reduced if the Generator Stator Ground Fault Relay indication approaches the alarm value of 50%. Refer to GOI-6 Section E for MVAR limits for generator stability.

[12.4] **MONITOR** generator conditions in accordance with **0-SO-35-4,** *Monitoring Generator Parameters.* [C.6] ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> The turbine load increase should be stopped until the MFW Reg valves are operating in the acceptable band.

[12.5] **ENSURE** MFW Reg valves are operating properly in auto (within ± 5% from zero deviation is acceptable). ☑

[12.6] **IF** MFW Reg. valves are NOT maintaining within the 5% band, THEN

NOTIFY Instrument Maintenance. ☑

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

> **NOTE**
>
> Instrument Maintenance support may be required if controller adjustments are needed.

[12.7] **ENSURE** Feedwater Heaters 5 and 6, MSR Drain Tank, and #7 Heater Drain Tank level controllers are adjusted to maintain levels within normal ranges. ☑

[13] **WHEN** reactor power is approximately 35%, **THEN**

VERIFY annunciator XA-55-4A, window C-5:

P-8 LOW POWER LOW FLOW TRIP BLOCK

is **DARK**. ☑

[14] **IF** unit is returning to service after a power reduction and the MSRs were removed from service, **THEN**

PLACE MSR HP steam warming valves to **OPEN** position:

STARTUP No. 1 Unit 1 Date To day

5.1 Power Ascension From 30% to 100% (continued)

MSR	HANDSWITCH	WARMING VALVE	INITIALS	
A1	HS-1-142	FCV-1-142	R01 1st	R02 CV
B1	HS-1-144	FCV-1-144	R01 1st	R02 CV
C1	HS-1-146	FCV-1-146	R01 1st	R02 CV
A2	HS-1-136	FCV-1-136	R01 1st	R02 CV
B2	HS-1-138	FCV-1-138	R01 1st	R02 CV
C2	HS-1-140	FCV-1-140	R01 1st	R02 CV

NOTE

#3 heater drain tank should remain drained with LCV-6-105A and B full open until reactor power exceeds ~45-50%.

[15] **ENSURE** #7 heater drain tank is on recirc in accordance with 1,2-SO-5-3. ☑

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

- [16.1] Condensate booster pumps. ☑
- [16.2] Hotwell pump. ☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) When placing additional condensate pumps in service, or HDT pumps in service, ensure that the MFW Reg. valves respond correctly and then stabilize in the acceptable band.

2) The following step may be performed out of sequence and may be marked N/A if it was previously performed in 0-GO-4.

[17] **WHEN** the condensate booster pump reaches approximately 140 amps, **THEN** **START** the following pumps in accordance with 1,2-SO-2/3-1:

[17.1] Third HW pump (if available).

[17.2] Second CBP.

NOTES

1) When placing additional condensate pumps or HDT pumps in service, ensure that the MFW Reg. valves respond correctly and then stabilize in the acceptable band.

2) With approval from Ops Superintendent, pumping forward of #7 Heater Drain System may be deferred until turbine load is approximately 60%, if system conditions warrant.

3) Steps 5.1[18] through 5.1[23] may be performed out of sequence.

[18] **WHEN** confirmation obtained from Chemistry Section that #7 heater drain tank chemistry is in limits, **THEN**

START pumping forward using the #7 heater drain tank pumps using 1,2-SO-5-3.

[19] **MAINTAIN** Condensate Booster Pump suction pressure greater than or equal to 75 psig (PI-2-77). ☑

[20] **MAINTAIN** Main Feedwater Pump suction pressure greater than 330 psig (PI-2-129). ☑

STARTUP No. 1 Unit 1 Date Today

5.1 Power Ascension From 30% to 100% (continued)

CAUTIONS

1) **MSR heatup limits are restricted to 100°F per hour or 25°F in a 15-minute period (automatic mode) or 50°F in a 30-minute period (manual mode). (SECO limits, contract 85P62-836839)**

2) **On the LP turbine inlet, do NOT exceed an instantaneous change of 50°F or a rate of change of 125°F/Hr for turbine expansion considerations.**

3) **For a cold start, the HP bundle warming valves should be opened at least 15 minutes before bringing the MSR in service.**

NOTES

1) Placing MSRs in service before 35% turbine load can cause rotor long condition.

2) Step 5.1[21] may be N/A'd if MSRs are in service.

[21] **WHEN** ≥ 35% turbine load, **THEN**

[21.1] **IF** cold start (LP turbine inlet metal temperature less than 300°F), **THEN**
DEPRESS the RESET pushbutton on the moisture separator reheater control panel. N/A ☐

STARTUP No. 1 **Unit** 1 **Date** To dy

5.1 Power Ascension From 30% to 100% (continued)

[21.2] **CLOSE** the following steam inlet leakoff isolation valves:

MSR	VALVE	POSITION	INITIALS
A-1	1-679	CLOSED	ROL
	1-714	CLOSED	
B-1	1-680	CLOSED	
	1-715	CLOSED	
C-1	1-681	CLOSED	
	1-716	CLOSED	
A-2	1-682	CLOSED	
	1-717	CLOSED	
B-2	1-683	CLOSED	
	1-718	CLOSED	
C-2	1-684	CLOSED	
	1-719	CLOSED	

NOTE

Due to interlocks on MSR valves, bypass valves must be opened prior to main isol valves. For example: Open FCV-1-241 and when full open, then open FCV-1-141.

[21.3] **ENSURE** MSR HP steam supplies ALIGNED as follows:

MSR	EQUIPMENT	HANDSWITCH	POSITION	√
A1	MSR BYPASS ISOL	HS-1-241A	OPEN	☑
	MSR MAIN ISOL	HS-1-141A	OPEN	☑
B1	MSR BYPASS ISOL	HS-1-243A	OPEN	☑
	MSR MAIN ISOL	HS-1-143A	OPEN	☑
C1	MSR BYPASS ISOL	HS-1-245A	OPEN	☑
	MSR MAIN ISOL	HS-1-145A	OPEN	☑
A2	MSR BYPASS ISOL	HS-1-235A	OPEN	☑
	MSR MAIN ISOL	HS-1-135A	OPEN	☑
B2	MSR BYPASS ISOL	HS-1-237A	OPEN	☑
	MSR MAIN ISOL	HS-1-137A	OPEN	☑
C2	MSR BYPASS ISOL	HS-1-239A	OPEN	☑
	MSR MAIN ISOL	HS-1-139A	OPEN	☑

STARTUP No. 1 Unit 1 Date To day

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Control valves ramp open for 120 minutes for turbine cold start.

2) MSR Control valves ramp open from the 400°F position to full open in one hour when Hot Start button was previously depressed during performance of 0-GO-4 or 0-GO-11.

[21.4] **DEPRESS** the RAMP pushbutton on the moisture separator reheater control panel to initiate steam flow to the reheater. ☑

[21.5] **IF** MSR controls will NOT function in RAMP mode, **THEN** **PERFORM** the following:

N/A

A. **DEPRESS** MANUAL pushbutton on MSR control panel. N/A

B. **ADJUST** manual potentiometer to gradually open MSR TCVs over approx. 120 minutes **WHILE** continuing in this procedure. N/A

[21.6] **OPEN** all MSR OPERATING vents (6-3 thru 6-93) on panel XS-6-3. ______

[21.7] **CLOSE** all MSR STARTUP vents (6-1 thru 6-91) on panel XS-6-1. ______

[21.8] **PERFORM** App. C to locally isolate MSR startup vents. ______

[21.9] **ENSURE** MSR HP steam warming valves are CLOSED:

MSR	EQUIPMENT	HANDSWITCH	POSITION	√
A1	MSR WARMING LINE	HS-1-142	CLOSED	☑
B1	MSR WARMING LINE	HS-1-144	CLOSED	☑
C1	MSR WARMING LINE	HS-1-146	CLOSED	☑
A2	MSR WARMING LINE	HS-1-136	CLOSED	☑
B2	MSR WARMING LINE	HS-1-138	CLOSED	☑
C2	MSR WARMING LINE	HS-1-140	CLOSED	☑

STARTUP No. 1 **Unit** 1 **Date** Today

5.1 Power Ascension From 30% to 100% (continued)

[21.10] **IF** this power ascension is during the months of October 1 through March 31, **THEN**

REFER to 0-PI-OPS-000-006.0 and consult System Engineer for position of MSR doghouses' vent dampers. N/A

[21.11] **IF** this power ascension is during the months of April 1 through September 30, **THEN**

OPEN MSR doghouses' vent dampers. ______

> **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.

[22] **IF** #7 heater drain tank (HDT) pressure is indicating an overpressure condition, **THEN**

PERFORM 1,2-SO-5-3, Section 8.0, Infrequent Operation to prevent #7 HDT overpressurization. ______

[23] **WHEN** approximately 40% turbine load:

[23.1] **VERIFY** annunciator XA-55-4A, window E-7:

C-20 AMSAC ARMED

is **LIT**. ☐

[23.2] **CLOSE** the drains on the operating main feedwater pump turbine (N/A other pump).

MFPT	DESCRIPTION	HANDSWITCH	POSITION	INITIALS
A	DRAIN VALVES	HS-46-14	CLOSED	______
B	DRAIN VALVES	HS-46-41	CLOSED	______

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) With verbal approval from the Operations Superintendent, placing the second main feed pump in service may be deferred until power is approximately 55% (Unit 1) or 65% (Unit 2). Logic prevents opening the standby MFPT condenser isolation valves if the pump is **NOT** reset prior to exceeding 9 million lbs/hr flow on the running pump.

2) LCO 3.3.2.1 (3.3.2) functional unit 6.f (AFW start function for the trip of both MFPT) allows one channel to be inoperable in Mode 1 for up to 4 hours when starting up or shutting down the second MFPT.

[24] **WHEN** approximately 40 to 45% turbine load, **THEN**

PLACE second MFPT in service by performing the following:

[24.1] **IF** the Operations Superintendent has approved one MFP operation during the power ascension, **THEN**

A. **RECORD** which MFPT is in service.
MFPT _________ _________

B. **MONITOR** loading of the MFP in service as load is increased. ☐

[24.2] **WHEN** second **MFPT** is to be placed in service, **THEN**

PLACE second MFPT in service in accordance with 1,2-SO-2/3-1. ☐

NOTE

This step and individual substeps may be performed out of sequence.

[25] **PERFORM** the following as system parameters permit:

[25.1] **VERIFY** three (3) Hotwell pumps running (if available). ☐

[25.2] **VERIFY** two (2) Condensate booster pumps running. ☐

[25.3] **VERIFY** MFW pump(s) in service (only 1 required if approved by Operations Superintendent). ☐

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

[25.4] **VERIFY** one (1) #7 Heater Drain Tank pump in service. ☐

[25.5] **ENSURE** one gland steam exhauster running and one stopped in AUTO position:

EXHAUSTER	HANDSWITCH	(√)	(√)
A	HS-47-209A	AUTO ☐	START ☐
B	HS-47-209B	AUTO ☐	START ☐

[25.6] **IF** gland seal water is being supplied from opposite unit, **THEN**

RESTORE normal gland seal water alignment (supplied from this unit) in accordance with 1,2-SO-37-1, Gland Seal Water System. ☐

NOTE

Steps 5.1[26] through 5.1[31] may be performed out of sequence.

[26] **IF** the second #7 heater drain tank pump has not been started, **THEN**

START the second #7 heater drain tank pump in accordance with 1,2-SO-5-3. ________

NOTE

Hydrogen pressure should be maintained greater than or equal to 66 psig.

[27] **ENSURE** generator hydrogen pressure is sufficient for anticipated load in accordance with TI-28, Figure A.14, Generator Capability Curve. ________

[28] **VERIFY** river water temperature within the limitations of the NPDES permit as specified in 0-PI-OPS-000-666.0. ☐

STARTUP No.________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

After refueling operations, NIS indications may be inaccurate until calibration at higher power levels. DO NOT increase power greater than 50% until Rx Engineering has ensured that applicable portions of 0-RT-NUC-000-001.0 are complete.

[29] **IF** applicable portions of 0-RT-NUC-000-001.0 are complete for power increase above 50% of rated thermal power,
THEN
N/A the following Step 5.1[30]. (Reactor Engineering) ________

[30] **IF** startup is following refueling activities, **THEN**
ENSURE the following performed prior to exceeding 50% thermal power: (may be performed in any order)

A. 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

________ Rx Eng ________ Date

B. 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

________ Rx Eng ________ Date

C. 0-PI-NUC-092-002.0, Detector Single Point Alignment.

________ Rx Eng ________ Date

D. 0-PI-IXX-092-N45.0, PR NIS Calibration..

________ MIG ________ Date

E. PR High Flux Trip reset to 109%. [C.3].

________ MIG ________ Date

F. Applicable portions of 0-RT-NUC-000-001.0 **COMPLETE** for operation above 50% power.

________ Rx Eng ________ Date

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

[31] **WHEN** reactor power is approximately 49%, **THEN**

PERFORM the following: (in any order).

[31.1] **ENSURE** indicated Axial Flux Difference is within the limits specified in the COLR (TS 3.2.1.1). _________

[31.2] **PERFORM** a conditional 0-SI-NUC-000-044.0, *Axial Flux Difference*. _________

NOTE

QPTR alarms pertain to the plant computer and annunciator panel AR-M4-B, windows B-3, C-3, and D-4. Alarms may sporadically occur at 1.5% when the setpoint is 2%.

[31.3] **PERFORM** a conditional 0-SI-NUC-000-133.0, *Quadrant Power Tilt Ratio*. _________

[31.4] **IF** QPTR exceeds 1.015,
THEN
CONTACT Reactor Engineering for evaluation. _________

[32] **DETERMINE** the following from TI-40 and **RECORD** in narrative log and below:

[32.1] Reactor preconditioned power level. ________ ☐

[32.2] Ramp rate restrictions: ☐

______ %/hour up to ______ % reactor power

______ %/hour up to ______ % reactor power

______ %/hour up to ______ % reactor power

[32.3] Restrictions on AFD and rod withdrawal rate:
(N/A if not applicable) ☐

____

____

5.1 Power Ascension From 30% to 100% (continued)

☐

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

CALCULATE reactor power:

Calorimetric power= U1118 $\frac{\_\_\_\_\_\_}{34.11}$ = _______%

☐

[41.3] **VERIFY** that all operable NIS Power Range channel drawers are within ± 2% of the calculated calorimetric power.

N-41	(XI-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 ☐

____

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

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

NOTES

1) More restrictive turbine load limit for Unit 1 is based on ensuring adequate MFP suction pressure to allow pumping against higher S/G pressures following S/G replacement. (Ref: DCN E21203A).

2) Siemens Westinghouse analysis has determined that the maximum Unit Two unit power with 1 MFP operation is 65% under worst case conditions. Operation at higher power levels are dependent on current conditions. This would require System Engineering evaluation.(Ref: DCN D21732A).

[42] **ENSURE** second MFPT is in service PRIOR TO increasing turbine load above 55% (Unit 1) or 65% (Unit 2). __________

STARTUP No.__________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

#3 and #7 heater drains must be pumping forward prior to exceeding 60% turbine load. This load limit assumes that both MFW pumps are in service. If only one MFWP is running, turbine load must be further limited to maintain adequate MFWP suction pressure.

[43] **PERFORM** the following PRIOR TO increasing turbine load above 60%.

[43.1] **ENSURE** #3 Heater Drain Tank pumping forward **USING** 1, 2-SO-5-2. ________

[43.2] **ENSURE** #7 Heater Drain Tank pumping forward **USING** 1, 2-SO-5-3. ________

[44] **ENSURE** at least one bus duct cooler is in service **USING** 0-SO-58-1 PRIOR TO increasing load above 729 MWe. ________

NOTES

1) TI-40 ramp rate restrictions are recorded in Step 5.1[32].
2) The following step may be marked N/A if intermediate power threshold is NOT applicable.

[45] **WHEN** Reactor Power approaches the Intermediate Power Threshold for the respective unit, **THEN**

ENSURE Reactor Power ramp rate target is **ESTABLISHED** at 2% / hr.

Intermediate Power Threshold value ___________ ________

STARTUP No._________ Unit _____ Date _________

5.1 Power Ascension From 30% to 100% (continued)

CAUTIONS

1) Valves 106A and 106B shall be verified to be operating properly after each #3 HDT pump start.

2) At approximately 79% turbine load with LCV-6-105A or B open and only two #3 HDT pumps are in service, the available NPSH for the MFP will be insufficient.

NOTES

1) When placing HDT pumps in service, ensure main feedwater pumps and main reg valves respond correctly and then stabilize in an acceptable band.

2) LCV-6-105A will come open at about 70% turbine load if condensate discharge pressure is high. Minimize duration at this load to reduce wear on the valve. As load is increased to 100% condensate pressure will gradually decrease allowing the #3 HDT pumps to pump forward and the condenser bypass valve(s) to close.

3) Steps 5.1[46] through 5.1[49] may be performed in any order.

[46] **WHEN** approximately 70% turbine load, **THEN**

[46.1] **PLACE** the third #3 heater drain pump in service in accordance with 1,2-SO-5-2. [C.2] ________

[46.2] **ENSURE** valves LCV-6-106A and LCV-6-106B are controlling #3 heater drain tank level properly. ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Evaluate starting and stopping of Condensate Demineralizer pumps using condensate pressure, MFP inlet pressure, condensate booster pump inlet pressure, and #3 and #7 HDT pump and bypass valve operation. The US/SRO may start or stop Condensate Demineralizer pumps at his discretion, but if any of the following occurs the pumps must be started:

1) Condensate Booster Pump suction pressure is less than 125 psig, as indicated on [PI-2-77].

2) Main Feedwater Pump suction pressure less than 420 psig, as indicated on [PI-2-129].

3) Injection Water Pump discharge pressure is less than 265 psig, as indicated by an alarm on XA-55-3B window E-1.

NOTES

1) Should #7 heater drain tank pump(s) amps swing or if system pressure needs to be increased by approximately 40 psig, then Cond DI Booster pumps can be started; however, two of the three pumps must be started at the same time.

2) When placing condensate pumps in service, ensure MFW Reg. valves respond correctly and then stabilize in an acceptable band.

[47] **EVALUATE** starting two condensate demineralizer booster pumps in accordance with 1,2-SO-2/3-1 (This step can be N/A'd or signed-off at time when pumps are started). ________

NOTE

If starting up following refueling operations and reactivity calculations and tests were completed at ≈ 30% reactor power, then reactivity calculations and tests must be performed again at ≈ 75% RTP.

[48] **IF** all applicable portions of 0-RT-NUC-000-001.0 are complete for power increase above 75% of rated thermal power, **THEN**

N/A the following Step 5.1[49]. (Reactor Engineering) ________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

After refueling, NIS indications may be inaccurate until calibration at higher power levels. DO NOT increase power above 75% until applicable portions of 0-RT-NUC-000-001.0 are complete.

[49] **IF** startup is following refueling, **THEN**

PERFORM the following prior to operation above 75% power: (may be performed in any order)

[49.1] **ENSURE** the following have been performed (may be N/A'd by Reactor Eng. and Instrument Maint. if NOT required):

A. 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

__________ Rx Eng __________ Date

B. 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

__________ Rx Eng __________ Date

C. 0-PI-NUC-092-036.0, Incore/Excore Detector Calibration (**N/A** if **NOT** required or if ΔAFD < 3%).

__________ Rx Eng __________ Date

D. 0-PI-NUC-092-002.0, Detector Single Point Alignment.

__________ Rx Eng __________ Date

E. 0-PI-IXX-092-N45.0, PR NIS Calibration.

__________ Rx Eng __________ Date

STARTUP No._________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

[49.2] **NOTIFY** Systems Eng to perform 0-PI-SXX-000-022.2 to check RCS Loop ΔT Zeros. [C.7] ☐

[49.3] **ENSURE** applicable portions of 0-RT-NUC-000-001.0 are complete for operation above 75% RTP.

____
Rx Engr.

NOTES

1) 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.

2) Steps 5.1[50] and 5.1[51] may be performed out of sequence.

[50] **PERFORM** the following at approximately 75% reactor power:

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

CALCULATE Calorimetric power:

$$\text{Calorimetric power= U2118} \quad \frac{\_\_\_\_\_\_}{34.55} = \_\_\_\_\_\_\%$$ ☐

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

CALCULATE reactor power:

$$\text{Calorimetric power= U1118} \quad \frac{\_\_\_\_\_\_}{34.11} = \_\_\_\_\_\_\%$$ ☐

[50.3] **VERIFY** that all NIS Power Range A channel drawers are within ± 2% of the calculated calorimetric power.

N-41	(XI-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 ☐

____

STARTUP No.________ **Unit** _____ **Date** ________

5.1 Power Ascension From 30% to 100% (continued)

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

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

CAUTIONS

1) **LCV-6-105A and/or 105B may be throttling open due to condensate system pressure being higher than #3 HDT pump discharge pressure.**

2) **Turbine runback will occur if #3 HDT pump flow to the condensate system drops below 5500 gpm (for greater than 10 seconds), condensate bypass valve LCV-6-105A or 105B opens, and turbine load is above 81% (Unit 1) or 82% (Unit 2).**

[51] **PRIOR** to increasing turbine load above 77%:

ENSURE the following:

[51.1] LCV-6-106A and -106B are controlling properly. ________

[51.2] LCV-6-105A and -105B are **CLOSED.** ________

NOTES

1) Ramp load rate increases shall be within the limits of TI-40

2) Intermediate Power Threshold ramp rate target value of 2% / hr may apply.

[52] **RECORD** power ascension ramp rate from TI-40. ________ ☐

NOTES

1) Operation above 75% Load with only two Hotwell Pumps in service requires further evaluation.

2) Steps 5.1[53] through 5.1[56] may be performed out of sequence.

[53] **CONTINUE** the power ascension to 90% reactor power. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[54] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

NOTE

Guidance on restoration of EHC Controls after a BOP runback via the valve position limiter is contained in Appendix B, *Turbine Runback Restoration.* [C.4]

[55] **MONITOR** the turbine load increasing and

MAINTAIN valve position limit approximately 10% above the current governor control indication as turbine load is changed. ☐

NOTE

When the turbine impulse pressure relay number is illuminated on Panel L-262, the relay is closed and Runback circuit is armed.

[56] **WHEN** greater than 77% Turbine Load, **THEN**

VERIFY **[PIS-47-13RLY1]** light **[1]**,'Turbine Runback From Loss of 1 MFP' is illuminated on Panel L-262. ________

[57] **WHEN** greater than 82% Turbine Load, **THEN**

VERIFY the following relay lights are illuminated on Panel L-262:

[57.1] **[PIS-47-13RLY2]**, Turbine Runback From #3HDT.**[2]** ☐

[57.2] **[PIS-47-13RLY 3]**, NPSH Protection VLV-6-106B closes on #3 HDT pump trip. **[3]** ☐

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Reactor power can be increased greater than 90% as long as adequate MFP suction is maintained.

2) Steps 5.1[58] through 5.1[62] may be performed out of sequence.

[58] **WHEN** approximately 85 to 90% reactor power

OR when determined by Unit SRO (if power raised above 90%), **THEN**

ENSURE third condensate booster pump in service in accordance with 1,2-SO-2/3-1. [C.2] ________

NOTE

A nominal CBP suction pressure of approximately 180 psig, as indicated on **[PI-2-77]**, will alleviate bypassing to the condenser at full power.

[59] **IF** condensate pressure is high resulting in #3 or #7 heater drain tank bypassing to the condenser, **OR** the normal level control valves are near full open, **THEN**

[59.1] **THROTTLE [14-550]** to attain desired condensate pressure. ________

[59.2] **IF** unable to throttle **[14-550]**, **THEN**

REFER to 1,2-SO-5-2, Section 8.0 to adjust condensate pressure. ________

OR

EVALUATE removal of the condensate demineralizer booster pumps (N/A if NOT in service). ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Two Cond DI Booster pumps must be started at the same time.

[60] **EVALUATE** starting available condensate demineralizer booster pump(s) to raise system pressure ~ 40 psig.

Pump Started YES ☐ NO ☐ _________

[61] **WHEN** reactor power is approximately 90%,
THEN

PERFORM the following:

[61.1] **ADJUST** Power Range instrumentation in accordance with 0-SI-OPS-092-078.0. ☐

[61.2] **INITIATE** performance of 1-PI-OPS-000-020.1 or 2-PI-OPS-000-022.1, Appendix B. ☐

CAUTION

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

[61.3] **ENSURE** the following level controllers are maintaining levels within normal ranges:

A. Secondary plant heaters. _________

B. MSR drain tanks. _________

CAUTION

DO NOT exceed an average of 3455.0 MWT during an 8-hour period. [C.1]

[62] **MONITOR** NIS, ΔT and calorimetrics on plant computer (pt. U2118) while increasing reactor power. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Feedwater venturi unfouling may impact U1118 indication. LEFM calorimetric power (U2118) is not affected by venturi unfouling.

2) If U1118 is being used to monitor reactor power due to LEFM unavailable, then Calorimetric Calculation should be performed prior to exceeding 97% reactor power.

3) Steps 5.1[63] through 5.1[67] may be performed out of sequence.

[63] **IF** Unit is returning to full power after a turbine load reduction to less than 50%

AND U1118 is being used to monitor power,
THEN

PERFORM the following prior to exceeding 97% power:

[63.1] **NOTIFY** Systems Engineering to perform 0-PI-SXX-000-022.2, Calorimetric Calculation, Section 8.1, if necessary. ☐

[63.2] **PERFORM** applicable sections of 0-PI-SXX-000-022.2 to adjust Feedwater Flow Constant. (N/A if NOT required)

____
BOP Eng

NOTES

1) Ramp load rate increases shall be within the limits of TI-40

2) Intermediate Power Threshold ramp rate target value of 2% / hr may apply.

[64] **RECORD** power ascension ramp rate from TI-40. _________ ☐

[65] **CONTINUE** power ascension to 100% RTP. ☐

5.1 Power Ascension From 30% to 100% (continued)

> **NOTE**
>
> Control rods may be used along with dilution during reactor power increase to maintain AFD within the target control band.

[66] **IF** diluting the RCS to increase T_{AVG}, **THEN**

CONTINUE dilution and increase turbine load to maintain T_{REF} with T_{AVG}. (0-SO-62-7) ☐

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

[67] **MONITOR** the turbine load increasing **AND**

MAINTAIN valve position limit approximately 10% above the current governor control indication as turbine load is changed. ☐

> **NOTE**
>
> Steps 5.1[68] through 5.1[71] may be performed out of sequence.

[68] **WHEN** reactor power approaches 100%, **THEN**

ADJUST governor valve position limiter ~ 2% above governor valve position. ☐

> **NOTE**
>
> Engineering recommends placing the 3rd Condensate Demineralizer Booster Pump in service when at full power. Operation of only 2 Condensate Demineralizer Booster Pumps is allowed but reduces the operating margin in the event of a condensate transient based on the lower suction pressure to the MFPs.

[69] **IF** it is desired to place the 3rd condensate demineralizer booster pump in service, **THEN**
START 3rd condensate demineralizer booster pump in accordance with 1,2-SO-2/3-1. ________

STARTUP No.__________ Unit _____ Date _________

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Governor valve position limit meter may NOT match the governor valve position meter; therefore, monitor the megawatt meter and valve position limit light continuously during the following step.

NOTES

1) Operation with the VALVE POS LIMIT light LIT is acceptable if unsatisfactory load swings are experienced.

2) Actions effecting reactivity are directed in the following step. All appropriate verifications and peer checks shall be utilized during performance.

[70] **IF** unsatisfactory load swings are experienced as the unit approaches full power, **THEN**

[70.1] **WITH** turbine load set for maximum of 100% power, **SLOWLY** and **CAUTIOUSLY PULSE** the governor VALVE POSITION LIMIT in LOWER direction while monitoring megawatts for a decrease and VALVE POS LIMIT light to ILLUMINATE. ☐

[70.2] **WHEN** the limiter just reaches the governor valve position,
THEN

STOP limiter adjustment. ☐

STARTUP No.__________ **Unit _____** **Date _________**

5.1 Power Ascension From 30% to 100% (continued)

CAUTION

Do not raise the limiter position unless the turbine control is positively controlling the turbine (limit light NOT LIT).

NOTE

Actions effecting reactivity are directed in the following step. All appropriate verifications and peer checks shall be utilized during performance.

[71] **PERFORM** the following if the limiter prevents reactor operation at approximately 100%:

- [71.1] **ADJUST** SETTER/REFERENCE controls to reduce turbine loading until the VALVE POS LIMIT light is NOT LIT. ☐
- [71.2] **INCREASE** VALVE POSITION LIMIT to allow a load increase using the SETTER/REFERENCE controls, NOT to exceed 3455.00 MWT. ☐

STARTUP No._________ Unit _____ Date ________

5.1 Power Ascension From 30% to 100% (continued)

NOTES

1) Full power operation is defined as 100% power operation at approximately 3455 MW_T instantaneous value, U2118 not to exceed 3455.00 MW_T average thermal power in an 8-hour period. [C.1]

2) Do not intentionally operate the reactor at greater than 100% power (e.g., if reactor power is less than 100% for any time period then operation at slightly greater than 100% to "make up" for "lost" power is not permissible). [C.1]

3) Computer point U2118 should be trended on a trend recorder in the unit horseshoe and monitored for increasing reactor power trends above 3455 MW_T. Prompt action shall be taken to decrease reactor power whenever an increasing power trend is observed. [C.1]

4) Do not exceed an 8-hour average value (U2126) of 3455.00 MW_T. Do not allow U2125 (one hour avg) to exceed 3455.00 MW_T (100%) for more than one hour. [C.1]

5) Portions of step 5.1[73] may be performed in parallel with step5.1[72] if required.

[72] **WHEN** the unit stabilizes at 100% reactor power,
THEN

PERFORM the following: (may be performed in any order)

[72.1] **ADJUST** Governor Valve position, rod height, and/or RCS boron concentration as necessary to establish core thermal power at desired value and Auctioneered Hi T-avg approximately equal to T-ref. ☐

[72.2] **NOTIFY** load coordinator that the power increase is complete. ☐

[72.3] **NOTIFY** Radiation Protection that power has stabilized at 100%. ☐

(step continued on next page)

5.1 Power Ascension From 30% to 100% (continued)

NOTE

Use of seal steam spillover bypass FCV-47-191 should be minimized to reduce the effect of unit trip on seal steam pressure.

[72.4] **IF** Seal Steam spillover bypass **[FCV-47-191]** is IN SERVICE, **THEN**

THROTTLE Seal Steam spillover bypass to control **[FCV-47-191]** as required to control seal steam pressure. ☐

[72.5] **IF** river temperature is less than 45°F, **THEN**

CONSULT Engineering to determine if third CCW pump should be removed from service. ☐

[72.6] **CONTACT** vibration engineer in Predictive Maintenance Group to monitor MFWP vibration. ☐

CAUTION

A bias adjustment in the upward direction (> 50% , Unit 1)(> +0, Unit 2) should NOT be used unless evaluated by Systems Engineering since this could impact a MFPT's maximum speed and the ability to fully load in the event the other MFPT trips.

[72.7] **IF** feed pump vibration is above desired levels, **THEN**
CONSULT with vibration engineer and system engineer to determine which feed pump to bias to reduce vibration. ☐

[72.8] **IF** MFPT master controller output is NOT indicating 45% to 55%
THEN
CONSULT with MFPT controls system engineer to evaluate if adjustment is required per 1,2-SO-2/3-1. ☐

STARTUP No._________ **Unit _____** **Date ________**

5.1 Power Ascension From 30% to 100% (continued)

[73] **IF** startup is following refueling activities, **THEN**

ENSURE the following are performed at approximately 100% Rated Thermal Power: (may be performed in any order)

[73.1] 0-PI-SXX-000-022.2, Calorimetric Calculation.

____
Systems Eng.

[73.2] 0-PI-SXX-000-022.1, Delta T and Tavg Update. [C.7]

____
Systems Eng.

[73.3] 0-SI-NUC-000-126.0, Hot Channel Factor Determination.

____________ ____________
Rx Eng Date

[73.4] 0-SI-NUC-000-120.0, Reactivity Balance.

____________ ____________
Rx Eng Date

[73.5] 0-SI-NUC-092-079.0, Incore-Excore Axial Imbalance Comparison.

____________ ____________
Rx Eng Date

[73.6] 0-PI-NUC-092-036.0, Incore-Excore Detector Calibration.

____________ ____________
Rx Eng Date

[73.7] 0-PI-IXX-092-N45.0, PR NIS Calibration (May be N/A'd if Engineering determines calibration performed at < 75% RTP is adequate.)

____
Inst Maint

[73.8] Applicable portions of 0-RT-NUC-000-001.0 are complete for full power operations.

____
Rx Engr

STARTUP No.__________ Unit _____ Date _________

5.1 Power Ascension From 30% to 100% (continued)

NOTE

This step may be performed out of sequence if required.

[74] **IF** startup is on Unit 1 and Steam Generator WR level recorders were re-scaled to 80% - 90% in 0-GO-2, **THEN**

NOTIFY MIG to re-scale LR-3-43A and LR-3-98A, Steam Generator Wide Range Level Recorders, to 0% - 100%. __________

[75] **IF** unit shutdown to minimum load, **THEN**

GO TO Section 5.3. __________

[76] **IF** unit is to be maintained at normal power, **THEN**

GO TO Section 5.2. __________

END OF TEXT

STARTUP No.__________ **Unit _____** **Date _________**

5.2 At Power Conditions

CAUTIONS

1) **Full power operation is defined as approximately 3455 MWT NOT to exceed 3455.0 MWT averaged over an 8-hour period. [C.1]**
2) **Power shall NOT exceed one hour average (U2125) of 3455.00 MWT.**
3) **Power shall NOT exceed an 8-hour average value (U2126) of 3455.00 MWT (readings at 0700, 1500 and 2300 hours).**

NOTES

1) Failure to comply with the following NERC VAR-002 requirements could result in a Utility Violation and/or monetary penalties.
2) The Transmission Operator shall be notified of any Voltage Regulator automatic trips to Manual or urgent Manual Transfers between Auto and Manual as soon as practical, but within 30 minutes [C.8]
3) The Transmission Operator shall be notified prior to a planned Voltage Regulator transfer between Auto and Manual.
4) All position changes (Auto or Manual) of the Voltage Regulator shall be entered into the Narrative Log along with the date, time of position change, reasons, anticipated duration, and notifications made.
5) Operation of main generator without automatic voltage control could impact gird voltage requirements. Refer to GOI 6 for MVAR limits.
6) Main Generator operation outside of the Voltage Schedule in GOI-6 requires that notification be made to the Transmission Operator (SELD) within 30 minutes. Narrative Log entries shall be made that include time, date, reason & duration, and notifications made
7) 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 30 minutes.
8) Steps in this section may be performed out of sequence.

[1] **ENSURE** Section 3.0, Precautions and Limitations, have been reviewed. __________

[2] **TREND** Computer point U2118 on a trend recorder in the unit horseshoe and monitor for increasing reactor power trends above 3455 MW_T. ☐